LIFE LONG LEARNING SYSTEM FOR TRAINING MEDICAL DOCTORS AND STUDENTS IN NUTRITION

STUDY MANUAL
Module Catalogue

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Notice

The writing of this text was accomplished through an extensive review of the literature and through the use of critiques provided by experts and content specialists. Every attempt has been made to develop a text that is current, accurate and presented in a logical manner. As this vast amount of information was processed, inaccuracies or omissions may have occurred. However, the authors, editors and publisher are not responsible for error or omissions or for any consequences from application of the information in this text and make no warranty, express or implied, with respect to the contents of this publication. The authors, editors and publisher have exerted every effort to ensure that drug and nutrient selection and dosage given in this text are in accordance with current recommendations and practice at the time of publication. However in view of ongoing changes in regulations and the constant flow of information, the reader is urged to check the package insert of drugs and nutrient supplements for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new or infrequently employed.

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CONTENTS

PREFACE

Life Long Learning system for training medical doctors and students in nutrition

The development of a Life Long Learning system (LLL) system in Nutrition is timely since the essential role of nutrition in human health is becoming increasingly recognized and, as a consequence, the need for a proper education in nutrition to improve patient care has arisen.

Increasing awareness of the role of nutrition in the prevention and treatment of human disease has made clinical nutrition one of the fast growing fields in medicine during the past two-three decades. The unprecedented expansion of human knowledge and education, growing differentiation in the levels and degree courses, makes it necessary to shift educational activities to lifelong learning, and to satisfy a growing proportion of specialists including health related professionals seeking programmes for additional qualification in a special field.

The intent of this manual is to allow students and physicians as well as other medical specialists to learn and understand recent achievements of the nutritional science and to apply them to patient care in the areas of prevention and treatment of disease.

This study manual for users of LLL system in nutrition contains:

- A core curriculum developed with the consensus of European partners according to the requirements of modern education in nutrition;
- A module catalogue - detailed list of modules in the system;
- Modules - the educational content of the system, divided into several volumes.

The main objective of this manual is to present the basic principles of clinical nutrition and metabolism and their application in clinical medicine. It is constructed in a way that introduces the learner step by step to a modern training content. The first part of the Study manual is the Module Catalogue which contains a list of modules with the corresponding system code and credits. The modules are presented in a summarized version with key messages, content and learning objectives, providing an overview of the training content and enabling the selection of modules of interest. The second part of the Study Manual consists of printed versions of the online and live modules. Modules will be published in periodic annual volumes as they are developed.

The volumes developed in 2005 contain 29 modules out of 105 of module catalogue, presenting the partners work by the Leonardo da Vinci project with important contribution of ESPEN. The programme for the 2006 and 2007 provides the topics of the modules, the authors who will develop the modules and calendar of events and live courses for intensive training and certification.

The following topics are planned to be developed and presented at live courses of LLL system in 2006-2007:

1. Live course of LLL system at ESPEN Congress in Istanbul 17-18 October 2006.

Topic 36 Nutrition in Elderly;

Topic 8 Approach to Oral and Enteral Nutrition;

Topic 24 Nutrition in Metabolic Syndrome;

Topic 26 Nutritional Support in Cancer.

Two topics with the modules from previous LLL course in Brussels will be presented in Turkish:

Topic 17 Nutritional Support in the Perioperative Period;

Topic 18 Nutritional Support in Intensive Care Patients.

2. Live course of LLL system in Pleven 07-10 September 2006

Topic 22 Nutrition in Patients with Lipidemias;

Topic 8 Approach to Oral and Enteral Nutrition.

3. Live course of LLL system at ESPEN Congress in Prague 09-10 September 2007

Topic 9 Approach to Parenteral Nutrition;

Topic 10 Nutritional Support in Pediatric Patients;

Topic 4 Nutritional Requirements for Health throughout Life Span.

Chapter 1
List of Modules
List of Topics and Modules to be Developed in the LLL System:

Code	Title	Credit
Topic 1 Metabolism of Macro- and Micronutrients		
EDU T1 M 1.1	Metabolism of Carbohydrates	**2**
EDU T1 M 1.2	Metabolism of Amino Acids and Proteins	**2**
EDU T1 M 1.3	Metabolism of Lipids	**2**
EDU T1 M 1.4	Metabolism of Vitamins	**2**
EDU T1 M 1.5	Metabolism of Minerals and Trace elements	**2**
EDU T1 M 1.6	Metabolism of Antioxidants	**2**
EDU T1 M 1.7	Fibre, Pre- and Probiotics	**2**
EDU T1 M 1.8	Metabolism of Phytochemicals	**2**
Topic 2 Water and Electrolytes in Health and Disease		
EDU T2 M 2.1	Water and Electrolytes in Health and Disease	**2**
Topic 3 Nutritional Assessment and Techniques		
EDU T3 M 3.1	Nutritional Assessment	**2**
EDU T3 M 3.2	Body Composition	**2**
EDU T3 M 3.3	Energy Balance	**2**
Topic 4 Nutritional Requirements for Health throughout Life Span		
EDU T4 M 4.1	Nutrition in Neonates	**2**
EDU T4 M 4.2	Nutrition in Infancy, Childhood and Adolescence	**2**
EDU T4 M 4.3	Nutrition in Pregnancy and Lactation	**2**
EDU T4 M 4.4	Nutrition in Adults	**2**
EDU T4 M 4.5	Nutrition in Elderly	**2**
Topic 5 Malnutrition		
EDU T5 M 5.1	Undernutrition - Simple and Stress Starvation	**2**
EDU T5 M 5.2	Overnutrition	**2**
Topic 6 Nutritional Support in Severe Malnutrition		
EDU T6 M 6.1	Nutritional Support in Severe Undernutrition	**2**
EDU T6 M 6.2	Nutritional Support in Severe Obesity	**2**
Topic 7 Enteral/Parenteral Nutrition - Substrates		
EDU T7 M 7.1	Substrates for Enteral and Parenteral Nutrition	**2**
EDU T7 M 7.2	Immunonutrition in Enteral and Parenteral Nutrition	**2**
Topic 8 Approach to Oral and Enteral Nutrition (EN)		
EDU T8 M 8.1	Indications and Contraindications for Enteral Nutrition	**3**
EDU T8 M 8.2	Oral and Sip Feeding	**3**
EDU T8 M 8.3	Techniques of EN	**3**
EDU T8 M 8.4	Diets for EN	**3**
EDU T8 M 8.5	Monitoring and Complications of EN	**3**
Topic 9 Approach to Parenteral Nutrition (PN)		
EDU T9 M 9.1	Indications and Contraindications for Parenteral Nutrition	**3**

EDU T9 M 9.2	Techniques of PN	**3**
EDU T9 M 9.3	Compounding	**3**
EDU T9 M 9.4	Drugs and Nutritional Admixtures in PN	**3**
EDU T9 M 9.5	Monitoring and Complications of PN	**3**
Topic 10 Nutritional Support in Pediatric Patients		
EDU T10 M 10.1	Enteral Nutrition in Pediatric Patients	**3**
EDU T10 M 10.2	Parenteral Nutrition in Pediatric Patients	**3**
EDU T10 M 10.3	Nutritional Support in ICU Pediatric Patients	**3**
Topic 11 Organization of Nutritional Care. Ethic and Legal Aspects		
EDU T11 M 11.1	Organization of Nutritional Care	**2**
EDU T11 M 11.2	Ethical and Legal Aspects	**2**
Topic 12 Nutritional Support in Gastrointestinal Diseases - Compromised Gut		
EDU T12 M 12.1	Nutritional Support in Extensive Gut Resections (short bowel)	**3**
EDU T12 M 12.2	Nutritional Support in Gastrointestinal Fistulas	**3**
EDU T12 M 12.3	Nutritional Support in Inflammatory Bowel Diseases	**3**
EDU T12 M 12.4	Nutritional Support in Acute and Chronic Diarrhoea	**3**
EDU T12 M 12.5	Nutritional Support in Irritable Bowel Syndrome (IBS), Constipation	**3**
EDU T12 M 12.6	Nutritional Support in Diverticulosis	**3**
Topic 13 Nutritional Support in Liver Disease		
EDU T13 M 13.1	Nutritional Support in Acute Liver Disease, including Liver Failure	**3**
EDU T13 M 13.2	Nutritional Support in Chronic Liver Disease, including Liver Failure	**3**
Topic 14 Nutritional Support in Pancreatic Disease		
EDU T14 M 14.1	Nutritional Support in Acute Pancreatitis	**3**
EDU T14 M 14.2	Nutritional Support in Chronic Pancreatic Diseases	**3**
Topic 15 Nutritional Support in Renal Diseases		
EDU T15 M 15.1	Nutritional Support in Acute Renal Diseases including Renal Failure	**3**
EDU T15 M 15.2	Nutritional Support in Chronic Renal Diseases including Renal Failure	**3**
EDU T15 M 15.3	Nutritional Support in Renal Replacement Therapy (Haemodialysis)	**3**
Topic 16 Nutritional Support in Injury and Sepsis		
EDU T16 M 16.1	Metabolic Changes in Injury and Sepsis	**3**
EDU T16 M 16.2	Nutritional Support in Sepsis	**3**
EDU T16 M 16.3	Nutritional Support in Trauma	**3**
EDU T16 M 16.4	Nutritional Support in Burns	**3**
Topic 17 Nutritional Support in the Perioperative Period		
EDU T17 M 17.1	The Stress Response and its Effects on Metabolism	**3**
EDU T17 M 17.2	Insulin Resistance and Glucose Control	**3**
EDU T17 M 17.3	Nutritional Support in the Perioperative Period	**3**
EDU T17 M 17.4	Nutritional Goals in the Perioperative Period	**3**
EDU T17 M 17.5	The Traumatized Patient	**3**
EDU T17 M 17.6	Facilitating Oral or Enteral Nutrition in the Postoperative Period	**3**
Topic 18 Nutritional Support in Intensive Care Unit (ICU) Patients		
EDU T18 M 18.1	Metabolic Response to Stress, Energy Requirements	**3**
EDU T18 M 18.2	Use of Macronutrients in ICU	**3**

EDU T18 M 18.3	General Principles of Prescription and Management in ICU	**3**
EDU T18 M 18.4	Routes of Nutrition in ICU	**3**
EDU T18 M 18.5	Use of Special Substrates in ICU	**3**
Topic 19 Nutritional Support outside the Hospital: Home Parenteral Nutrition (HPN) in Adult Patients		
EDU T19 M 19.1	Indications and Epidemiology	**3**
EDU T19 M 19.2	Training and Monitoring	**3**
EDU T19 M 19.3	Venous Access for Home Parenteral Nutrition	**3**
EDU T19 M 19.4	HPN in Cancer Patients	**3**
EDU T19 M 19.5	Guidelines for Home Parenteral Nutrition Support in Chronic Intestinal Failure	**3**
EDU T19 M 19.6	Metabolic Complications of Home Parenteral Nutrition in Chronic Intestinal Failure	**3**
Topic 20 Nutritional Support in Cardio-Vascular Diseases (CVD)		
EDU T20 M 20.1	The Place of Nutrition in the Prevention of CVD	**3**
EDU T20 M 20.2	Nutrition in CVD - Special Diets	**3**
EDU T20 M 20.3	Nutritional Support in Acute Coronary Events	**3**
Topic 21 Nutrition in Diabetes		
EDU T21 M 21.1	Nutrition in Prevention and Management of Diabetes Mellitus	**3**
EDU T21 M 21.2	Nutritional Support in Diabetes	**3**
Topic 22 Nutrition in Lipidemias		
EDU T22 M 22.1	Dislipidemias and Nutrition	**3**
EDU T22 M 22.2	Adaptive Changes of Lipid and Lipoprotein Metabolism	**3**
Topic 23 Nutrition in Obesity		
EDU T23 M 23.1	Nutrition in Prevention and Treatment of Obesity	**3**
Topic 24 Nutrition in Metabolic Syndrome		
EDU T24 M 24.1	Nutrition in Prevention and Treatment of Metabolic Syndrome	**3**
EDU T24 M 24.2	Frontiers in Research of Metabolic Syndrome	**3**
Topic 25 Nutritional Support in Neurological Diseases		
EDU T25 M 25.1	Nutritional Support in Acute Stroke	**3**
EDU T25 M 25.2	Nutritional Support in Chronic Neurological Diseases	**3**
Topic 26 Nutritional Support in Cancer		
EDU T26 M 26.1	Pathogenesis of Cancer Cachexia	**3**
EDU T26 M 26.2	Treatment of Cancer Cachexia	**3**
EDU T26 M 26.3	Nutritional Support during Radiation Treatment	**3**
EDU T26 M 26.4	Nutritional Support during Chemotherapy	**3**
Topic 27 Nutritional Support in AIDS		
EDU T27 M 27.1	Nutritional Support in AIDS	**3**
Topic 28 Nutrition in Allergic Diseases		
EDU T28 M 28.1	Nutrition and Food Allergy	**2**
Topic 29 Nutrition in Hereditary Diseases		
EDU T29 M 29.1	Nutrition in Phenylketonuria	**2**

EDU T29 M 29.2	Nutrition in Lactose Intolerance	**2**
EDU T29 M 29.3	Nutrition in Celiac Disease	**2**
EDU T29 M 29.4	Nutrition in Cystic Fibrosis	**2**
Topic 30 Nutrition in Skeletal and Joint Diseases		
EDU T30 M 30.1	Nutrition in Prevention and Management of Osteoporosis	**2**
EDU T30 M 30.2	Nutrition in Prevention and Treatment of Arthritis	**2**
Topic 31 Nutrition in Behavioral Disorders		
EDU T31 M 31.1	Nutrition in Anorexia Neurosis	**2**
EDU T31 M 31.2	Nutrition in Bulemia	**2**
EDU T31 M 31.3	Nutrition in Alcohol and Drug Abuse	**2**
Topic 32 Food Safety		
EDU T32 M 32.1	Food Safety. Exposure to Toxic Environment	**2**
Topic 33 Nutrition and Public Health		
EDU T33 M 33.1	Nutrition and Public Health	**2**
Topic 34 Nutrigenomics		
EDU T34 M 34.1	Nutrigenomics - New Research Approaches	**2**
EDU T34 M 34.2	From Nutrients To Genes: Response to Nutrients	**2**
Topic 35 Economics of Nutrition		
EDU T35 M 35.1	Economics of Nutrition	**2**
Topic 36 Nutrition in Elderly		

Chapter 2

Module Catalogue

Short Description of Modules: Learning Objectives, Content and Key Messages

Topic 1 Metabolism of Macro- and Micronutrients

Module 1.1 Metabolism of Carbohydrates

Learning Objectives

To know major pathways of glucose metabolism in humans;
To understand regulation of glucose metabolism in healthy subjects;
To know effect of stress and stress hormones on glucose metabolism;
To be informed about alterations of glucose metabolism in sepsis and aggression.

Content

1. Carbohydrate in normal metabolism
2. Effects of stress on glucose metabolism
3. Regulation of glucose metabolism
4. Metabolic responses to critical illness

Key Messages

Glucose metabolism is primarily regulated by the balance between anabolic (insulin) and catabolic (epinephrine, glucagon, cortisol, growth hormone) hormones;
In fasting conditions, catabolic hormones enhance hepatic glucose production and decrease glucose utilization in skeletal muscle and adipose tissue;
In postprandial conditions, insulin stimulates glucose oxidation in liver and glucose storage in liver and skeletal muscles and inhibits hepatic glucose production;
Stress, by increasing catabolic hormones, causes insulin resistance and hyperglycemia. In addition, inflammatory mediators (TNF-α, interleukins) are generally activated during critical illness and antagonize insulin's actions. This results in marked insulin resistance and hyperglycemia, which may have deleterious effects in the long term.

Module 1.2 Metabolism of Amino Acids and Proteins

Learning Objectives

To know the basic routes of protein synthesis and degradation in cells;
To understand whole body protein synthesis and degradation during acute and chronic disease states.

Content

1. Introduction
2. How proteins are synthesized
3. How proteins are broken down
4. How to measure whole body protein synthesis and breakdown
5. Principle of ~UVbRa measurement
6. How to measure organ protein synthesis and breakdown

7. Which processes affect whole body protein synthesis and/or breakdown
8. Nutrition
   - 8.1 Acute and prolonged starvation
   - 8.2 Aging
   - 8.3 Exercise
   - 8.4 Acute disease
   - 8.5 Chronic disease

Key Messages

Proteins play a crucial role in biological processes and are continuously synthesized and broken down by different routes;
Whole body protein synthesis and breakdown are each the net result of protein synthesis and breakdown in various organs;
On a whole body level, protein synthesis and breakdown are measured with the use of amino acid isotopes;
Although, in health, adults remain in zero protein balance, synthesis and breakdown are differentially affected by the stages of disease and prevailing conditions, e.g. starvation, feeding, sepsis, growth, convalescence, activity, etc., resulting in either net catabolism or anabolism.

Module 1.3 Metabolism of Lipids

Learning Objectives

To characterize principal pathways of lipid metabolism;
To know the regulatory mechanism of lipid metabolism;
To be familiar with basic changes in lipid metabolism during a critical illness.

Content

1. Basic pathways in lipid metabolism
2. Lipid digestion and absorption
3. Lipid metabolism in fasting conditions
4. Influence of surgical stress, sepsis and organ failure

Key Messages

Lipids are not only very important energy substrates but some fatty acids and lipid-soluble vitamins act as metabolic regulators. After ingestion of a mixed meal, fat is preferentially stored in adipose tissue whereas carbohydrates are oxidized;
During fasting, fatty acids are released from adipose tissue and utilized as energy substrate in liver and extra hepatic tissue. This process is effectively controlled by catecholamines and insulin, which regulate hormone sensitive lipase and lipoprotein lipase;
During a critical illness, increased adipose tissue lipolysis together with decreased fatty acid oxidation leads to increased triglyceride production and deposition in the liver (and in other tissues), with an augmented production of VLDL. This situation may contribute to the aggravation of organ dysfunction. In addition, several major changes are observed with respect to the concentration and composition of plasma cholesterol-rich lipoproteins.

Module 1.4 Metabolism of Vitamins

Learning Objectives

To understand the physiological roles of vitamins;

To know the effects of deficiency;
To know the methods of measurements and their limitations.

Content

1. Thiamine (vitamin B1)
2. Riboflavin (vitamin B2)
3. Niacin (vitamin B3)
4. Pyridoxal (vitamin B6)
5. Folate (vitamin B9)
6. Vitamin B12
7. Vitamin A
8. Vitamin D
9. Biotin
10. Vitamin C
11. Vitamin E
12. Vitamin K
13. Vitamins - summary of influence of metabolic stress
14. Assessment of vitamin status in clinical practice

Key Messages

Vitamins are essential organic micronutrients, which are required in the diet in relatively small amounts;
However, they are necessary for both healthy and diseased organism;
Deficiency states of vitamins avitaminosis leads to impairing certain important functions.

Module 1.5 Metabolism of Minerals and Trace Elements

Learning Objectives

To understand the normal roles of minerals and trace elements;
To know the effects of deficiency or excess;
To know the methods of measurements and their limitations.

Content

1. Zinc
2. Copper
3. Iron
4. Selenium
5. Chromium
6. Molybdenum
7. Manganese

Key Messages

Trace elements are essential inorganic micronutrients, which are required in the diet in very small amounts;
In spite that only small amounts are necessary they are critical for both health and disease;
The deficiency of certain trace elements leads to impairing important functions.

Module 1.6 Metabolism of Antioxidants

Learning Objectives

To know the basic sources of free radicals in human body;
To explain basics of antioxidant defence system;
To list some conditions leading to oxidative stress;
To characterize ischemia/reperfusion (I/R) injury.

Content

1. Definitions
2. What is a free radical?
3. What is antioxidant capacity?
4. What is oxidative stress?
5. Antioxidative therapy - facts and fancy
6. Ischemia/reperfusion injury
7. Some major questions related to antioxidation therapy, yet to be answered

Key Messages

Antioxidants are important compounds to protect cells and tissues from oxidative and nitrosic stress. It has been becoming more and more clear that the major antioxidants, vitamins E, C and GSH may act in a synergistic or complementary fashion;
Ascorbate scavenges a wide variety of oxidants, including myeloperoxidase-derived hypochlorite, and regenerates vitamin E;
A network of antioxidants for defense against oxidative stress may have the benefit of functional overlap, which will ensure that any individual component will be available in sufficient amounts on demand. Thus, it may be more beneficial to provide the patients with an antioxidant cocktail. We propose tentative proportions of supplementary vitamin E, C and b-carotene as 1:2:0.1;
The present accumulated knowledge about antioxidants undoubtedly represents a great challenge for physicians, nutritional scientists, pharmacists, food technologists and food chemists. The increasing number of investigations in this field will presumably raise more questions as well as solutions;
Hopefully, future success in putting acquired knowledge into practice will be rewarded by improved patient survival. Continued rigorous critical evaluation of assumptions and hypotheses about relationships between diet, nutrition, health and disease should provide us with reliable knowledge of what can and what cannot be achieved through clinical nutrition.

Module 1.7 Fibre, Pre- and Probiotics

Learning Objectives

To identify the different physiological and chemical properties of fibre;
To explain the different effects of fibre in the gastrointestinal tract;
To identify the different physiological and chemical properties of pre-and probiotics;
To explain the different effects of pre-and probiotics.

Content

1. Classification of dietary fibres
2. Effects of fibres in the gastrointestinal tract
3. Nutritional sources of fibres
4. Effects of pre-and probiotics and their role in special clinical situations

5. Nutritional sources of probiotics

Key Messages

Regular fibre intake is essential for the general health and a normal bowel function;
Diets containing fermentable fibre as a source of short chain fatty acids (SCFA's) play a fundamental role in maintaining gut mucosal function by avoiding epithelial atrophy and possibly bacterial and toxin translocation from the gut lumen into the circulation and also may reduce the incidence of systemic infections and diarrhoea in tube-fed patients;
Probiotics are important in treatment of gut diseases (e. x. diaerhoea).

Module 1.8 Metabolism of Phytochemicals

Learning Objectives

To identify the different physiological and chemical properties of phytochemicals;
To explain the different effects of photochemical;
Phytochemicals as the natural sources of vitamins, antioxidants and microelements.

Content

1. Vegetables and Fruits
   - 1.1 Cruciferous Vegetables (broccoli, cabbage, brussel sprouts, cauliflower)
   - 1.2 Leafy Greens (spinach, kale, parsley, collard)
   - 1.3 Tomatoes
   - 1.4 Carrots
   - 1.5 Beets
   - 1.6 Grapes
   - 1.7 Soybeans
   - 1.8 Grape seeds
   - 1.9 Sunflower seeds
2. Herbs
   - 2.1 Garlic
   - 2.2 Green Tea
   - 2.3 Milk Thistle
   - 2.4 Bilberry
   - 2.5 Astragalus
   - 2.6 Aloe
   - 2.7 Schisandra
   - 2.8 Siberian ginseng
   - 2.9 Turmeric
   - 2.10 Curcumin
   - 2.11 Ginko Biloba
   - 2.12 Ginger
   - 2.13 Cayenne pepper

Key Messages

Which phytochemicals possess true disease-preventing and/or health-promoting properties and therapeutical potentials?
Once identified, what are the dose limits in order to avoid risks to health?
Are potential side effects likely to emerge following high intakes of nutritive and non-nutritive phytochemicals?
Are phytochemicals to be considered as future intravenous components the green parenteral?

Topic 2 Water and Electrolytes in Health and Disease

Module 2.1 Water and Electrolytes in Health and Disease

Learning Objectives

To understand basic concepts in water and electrolyte metabolism;
To be aware of the influence of trauma and sepsis on fluid and electrolyte physiology - to understand the consequences and treatment of extra renal losses of water.

Content

1. Introduction
2. Water and fluid compartments
3. Flux of fluid through the gastrointestinal tract
4. Role of the kidney
5. External fluid balance
6. Effects of starvation and injury
7. Electrolytes
8. Sodium
9. Potassium
10. Magnesium
11. Phosphate
12. Calcium

Key Messages

Fluid balance should be considered in terms not only of external loss or gain but also of the intercompartmental shifts, which occur with disease;
Injury and starvation are associated with retention of salt and water and expansion of ECF;
The ability to excrete an excess salt and water load returns during convalescence. Potassium, phosphate and Mg are lost during catabolic illness and require replacement during the anabolic convalescent phase;
A proper understanding of normal and abnormal fluid and electrolyte physiology is necessary in the proper management of patients receiving nutritional support.

Topic 3 Nutritional Assessment and Techniques

Module 3.1 Nutritional Assessment

Learning Objectives

To understand nutritional screening an assessment;
To assess a patient for general nutritional status;
To realize the signs and the symptoms of nutritional problems;
To be familiar with nutritional screening;
To understand different methods used for the nutritional assessment;
To know limitations of different method for nutritional assessment;
To know the benefits and limits of laboratory and balance-studies for nutritional assessments.

Content

1. Nutritional screening and assessment
   1.1 Nutritional screening
   1.2 Nutritional assessment
2. Techniques used in nutritional assessment
   2.1 Clinical evaluation
   2.2 Body composition
   2.3 Functional tests
   2.4 Laboratory parameters
   2.5 Assessment of food intake

Key Messages

To understand how important to get the history taking and physical examination on the definition of nutritional problems;
Nutritional screening and assessment are important part of patient care to identify patients requiring nutritional support;
Nutrition screening is an important tool for rapid and simple evaluation of an individual nutritional status;
Nutrition assessment is important for detailed diagnosis of acute and chronic malnutrition (over- and undernutrition);
Nutrition screening and assessment are important in clinical medicine because acute and chronic malnutrition (over- and undernutrition) are prevalent.

Module 3.2 Body Composition

Learning Objectives

Assumptions and application of techniques for the measurement of body composition;
To have knowledge on their precision and limitations;
To be informed about the two-, three- and four-compartment models for body composition.

Content

1. Anthropometry
   1.1 The two-compartment model
   1.2 The four-compartment model
2. The methods of measurement
   2.1 Underwater weighing
   2.2 MRI and CT scan
   2.3 Subcutaneous fat skin folds measurement
   2.4 Dual energy X-ray absorptiometry (DEXA)
   2.5 Body water measurement
   2.6 Muscle mass measurement
   2.7 Body impedance

Key Messages

In vivo body composition measurements are always indirect, based on one or more assumptions concerning the nature of the body components fat mass and fat-free mass;
The other methods are all double-indirect, validated against indirect methods, and therefore based on more assumptions;
Whatever method is used, the starting point is the measurement of body mass with a calibrated scale;

Subsequent subdivision of body mass in components like fat mass and fat-free mass has an accuracy of 1 kg or less, especially in patients where assumptions are often violated.

Module 3.3 Energy Balance

Learning Objectives

To know measurement of energy expenditure with indirect calorimetry;
To be familiar with components of daily energy expenditure;
To know determinants of energy expenditure and its components;
To be aware of disease related alterations in energy expenditure.

Content

1. Calorimetry for the measurement of energy expenditure
2. Measuring separate components of daily energy expenditure with a ventilated hood and a respiration chamber
3. Measuring average daily energy expenditure with doubly labeled water
4. Components of energy expenditure, measurement and determinants
5. Disease related alterations in energy expenditure

Key Messages

Energy expenditure is mostly measured by indirect calorimetry, based on measurement of oxygen consumption and carbon dioxide production with a ventilated hood, in a respiration chamber or with doubly labelled water in the clinic or in the daily living environment;
Daily energy expenditure consists of four components, i.e. the sleeping metabolic rate (SMR), the energy cost of arousal, the thermic effect of food or diet induced energy expenditure (DEE), and the energy cost of physical activity or activity induced energy expenditure (AEE). Sometimes daily energy expenditure is divided into three components, taking sleeping metabolic rate and the energy cost of arousal together as energy expenditure for maintenance or basal metabolic rate (BMR);
BMR is usually the main component of average daily metabolic rate (ADMR). BMR is mainly determined by body size or fat-free mass. DEE is a function of dietary intake and amounts 10% of ADMR for subjects fed in energy balance;
AEE is the most variable component of ADMR. During severe acute disease and in many chronic wasting diseases BMR is elevated. ADMR under these circumstances is however often normal due to adaptive decreases in AEE.

Topic 4 Nutritional Requirements for Health throughout Life Span

Module 4.1 Nutrition in Neonates

Learning Objectives

To understand the physiological differences, concerning growth and development that define the nutritional needs of the neonates;
To understand the differences in the balance of energy, proteins, water, electrolytes, minerals and micronutrients in the newborn;
To give generally accepted recommendations for all nutrients intake.

Content

1. Premature / Low Birth Weight infants (LBWI)
   - 1.1 Energy
   - 1.2 Proteins
   - 1.3 Fats
   - 1.4 Carbohydrates
   - 1.5 Water
   - 1.6 Minerals
   - 1.7 Electrolytes
   - 1.8 Vitamins
2. Healthy term infants 0 - 12 months
   - 2.1 Energy
   - 2.2 Protein
   - 2.3 Electrolytes, minerals vitamins
3. Summary

Key Messages

Age definition of premature and Low Birth Weight Infants (LBWI);
Physiological characteristics of full-term and premature/LBWI define their different nutritional needs;
The needs of protein, energy and all other nutrients are much higher than in the adults;
Most part of the nutrients is used for cellular proliferation and less for physical activity in all ages and may have long lasting sequelae;
In the neonates and especially low birthweight, undernutrition can easily cause physical and mental retardation that may be irreversible.

Module 4.2 Nutrition in Infancy, Childhood and Adolescence

Learning Objectives

To understand the physiological differences, concerning growth and development that define the nutritional needs in different ages;
To understand the differences in the balance of energy, proteins, water, electrolytes, minerals and micronutrients in different ages;
To give generally accepted recommendations for all nutrients intake.

Content

1. Introduction
2. Children from 1 to 10 years
3. Adolescents from 11 to 24 years
4. Energy
   - 4.1 Proteins
   - 4.2 Minerals
   - 4.3 Vitamins
   - 4.4 Special nutritional problems
5. Summary

Key Messages

Definition of age periods in infancy, childhood and adolescence, concerning nutrition;
Physiological characteristics of the different age groups define their different nutritional needs;

The needs of protein, energy and all other nutrients in infancy, childhood and adolescence are much higher than in the adults;
Most part of the nutrients is used for cellular proliferation and physical activity;
In all ages undernutrition causes growth retardation and may have long lasting sequelae;
In the neonates and especially low birthweight that physical and mental retardation may be irreversible.

Module 4.3 Nutrition in Pregnancy and Lactation

Learning Objectives

To know the recommended diet allowances for pregnancy and lactation;
To be familiar with the nutritional assessment of the expectant mother;
To know the most common indications for nutritional support during pregnancy and lactation complicated by starvation;
To know the risks of gain weight, anemia, malnutrition, etc.;
To learn the rules of artificial nutrition during pregnancy and lactation complicated by starvation;
To recognize the adverse effects of starvation on pregnancy and fetal outcome.

Content

1. Nutritional assessment of the expectant mother
2. Physiologic changes and metabolic changes in pregnancy
3. Essential of human lactation
4. Recommended diet allowances for pregnancy and lactation
5. Risk of pregnancy related complications
6. Indications and aims of nutritional support

Key Messages

Pregnancy constitutes a special situation, where adequate nutrition is vital for both mother and child;
The recommended diet allowances for pregnancy and lactation should be followed to avoid a risk of weight gain, anemia, hypertension, malnutrition and other complications of pregnancy and lactation;
Special nutritional support should be implemented in case of pregnancy and lactation, particularly for pregnancy with complications and starving or semistarving pregnant women;
Delay in giving nutritional support to starving or semistarving pregnant women adversely affects the fetus and may result in increased fetal mortality and morbidity.

Module 4.4 Nutrition in Adults

Learning Objectives

To learn how to estimate energy requirements of healthy adults;
To determine their macronutrient requirements at rest and during physical activity;
To learn which type of macronutrients are beneficial for health.

Content

1. Energy requirements
   1.1 Carbohydrates

1.1.1 Glycaemic index (GI)
1.2 Lipids
1.2.1 Saturated fatty
1.2.2 Monounsaturated fatty
1.2.3 Polyunsaturated fatty acids (PUFA)
1.3 Proteins
1.4 Vitamins, Minerals and Electrolytes

Key Messages

Total energy requirements vary from one individual to another;
Carbohydrate and fat requirements are set at 50-55% and 30-35%, respectively, of total energy intake for healthy subjects at rest;
Protein allowances should be 0.8g/kg b.w;
Physical exercise increases energy requirements;
The macronutrient requirement of physically active subjects is similar to resting subjects although an increased carbohydrate intake may be recommended;
During exercise lasting more than one hour, carbohydrate supplementation may help to delay fatigue.

Module 4.5 Nutrition in Elderly

Learning Objectives

To understand some of the relevant physiological changes of aging;
To understand the mechanism of malnutrition in the elderly;
To know the prevalence, causes and consequences of malnutrition in the elderly;
To be able to screen and assess elderly patients for malnutrition in the context of health and disease;
To be able to manage and treat malnutrition in the elderly.

Content

1. Introduction
   1.1 Malnutrition in the elderly and outcome
   1.2 Detection of malnutrition in the elderly
   1.3 Mini Nutritional Assessment (MNA)
2. Changes in body composition and function
   2.1 Energy balance
   2.2 Appetite in the elderly
   2.3 Small-bowel bacterial overgrowth in elderly people
3. Changes in nutrient requirements
   3.1 Total Energy
   3.2 Protein
   3.3 Fat
   3.4 Carbohydrates
   3.5 Fibre
   3.6 Fluids
   3.7 Vitamins
   3.8 Minerals
   3.9 Nutritional intervention
   3.10 Pressure sores
4. The ageing immune system
5. Drug interactions in the elderly

6. Nutrition in different conditions in the elderly
   - 6.1 Osteopenia with ageing
   - 6.2 The aged diabetic
   - 6.3 Cardiovascular system and ageing
   - 6.4 Malnutrition and mental function in the elderly
   - 6.5 Cancer in the elderly
7. Ethical considerations

Key Messages

The elderly as a group are particularly susceptible to malnutrition especially when suffering from chronic mental or physical disease;
Elderly patients should all be screened for risk of malnutrition and have an appropriate care plan. Where significant malnutrition exists there is clear evidence of benefit from nutrition support;
There is suggestive evidence that good nutrition and even the use of vitamin and mineral supplements may have an important preventive role in maintaining health and quality of life in the elderly;
In making any care plan, ethical considerations are important, respecting the patient's autonomy, ensuring benefit and avoiding harm.

Topic 5 Malnutrition

Module 5.1 Undernutrition - Simple and Stress Starvation

Learning Objectives

To know how the body reacts to short-term and long-term starvation during non-stress conditions;
To understand the difference between simple and stress starvation;
To know the risks of previous malnutrition for surgical stress and acute illness;
To know strategy of nutritional treatment of malnourished patients who require surgical treatment.

Content

1. Definition and classification of malnutrition
2. Undernutrition
3. Aetiology of undernutrition
4. Disease-related undernutrition
5. Social and psychological factors which lead to undernutrition:
6. Prevalence

Key Messages

Humans adapt well to short or a longer-term starvation, using their reserve stores of carbohydrates, fat and protein;
Reduction of energy expenditure and conservation of body protein are further reaction to starvation. Energy stores are replenished during feeding period;
Long-term partial or total cessation of energy intake leads to marasmic wasting;
With the addition of the stress response, catabolism and wasting are accelerated and the normal adaptive responses to simple starvation are overridden;
Weight loss in either situation results in impaired mental and physical function, as well as poorer clinical outcome;

Previously malnourished subjects have less reserve with which to face an acute illness. They are unable to release sufficient amounts of endogenous nitrogen in response to trauma and infection with subsequent higher mortality, more complications and prolonged recovery;
If surgery is planned in these patients nutritional support improves physiological functions and lessens surgical risk.

Module 5.2 Overnutrition

Learning Objectives

To explain the risk of chronic overfeeding;
To explain the nutritional and physiological role of adipose tissue;
To explain the relationship of obesity to metabolic syndrome;
To summarize shortly the nutritional treatment of obese patients;
To understand problems of perioperative nutrition and risk of obese patients;
To learn basic nutritional approaches to bariatric surgery.

Content

1. Physiology of adipose tissue
2. Acute overfeeding
3. Chronic overfeeding
4. Risks of obesity
5. Socio-economic
6. Metabolic syndrome
7. Treatment of obesity
8. Perioperative nutritional treatment of obese patients
9. Bariatric surgery

Key Messages

The main complication of chronic overnutrition is obesity, which is associated with serious complications, e.g. diabetes, cardiovascular disease and cancer. These can be decreased by losing 5-10% of weight, reducing insulin resistance, and the production of many atherogenic, pro-coagulatory, diabetogenic, hormonal and metabolically active substances;
Even with such a small reduction in weight, adipose tissue is again capable of protecting organs such as liver, pancreas and muscles from accumulation of fat. In catabolic illness, obese patients are just as vulnerable to malnutrition and should be screened and given appropriate nutritional support;
The incidence of peri-operative complications is higher in the obese, but has been significantly reduced by laparoscopic surgery;
The risks of morbid obesity are high and can be significantly reduced by bariatric surgery;
Gastric banding cannot be successful without proper perioperative and postoperative nutritional support and diet education.

Topic 6 Nutritional Support in Severe Malnutrition

Module 6.1 Nutritional Support in Severe Undernutrition

Learning Objectives

To characterize the metabolic situation in severely malnourished patient;

To know methods of nutritional support in severely malnourished patients;
To be aware of possible risks connected with nutritional support in severely malnourished patients.

Content

1. Pathophysiology
2. Goals of nutritional therapy
3. Oral nutritional support
4. Enteral nutrition
5. Parenteral nutrition
6. Monitoring
7. Rehabilitation

Key Messages

Lack of electrolytes and micronutrients should be supposed in severely malnourished subjects. Supplementation of deficient electrolytes and vitamins is necessary during nutrition support of severely malnourished persons;
The intake of macronutrients should be gradually increased in severely malnourished persons;
Severely malnourished patients need more K, P, Mg, Zn, and vitamins than well-nourished subjects.
Final energy and protein needs are also higher (up to 4045 kcal/kg/day and 1.5 g/kg/day, respectively) in order to accelerate repletion of deficits;
The administration of standard formula for enteral nutrition may be supplemented with parenteral infusion of electrolytes, minerals and vitamins;
The early goal of feeding is improved function and accelerated rehabilitation. Restoration of lean mass is a longer term objective over weeks and months.

Module 6.2 Nutritional Support in Severe Obesity

Learning Objectives

To know how to estimate energy requirements in severely obese patient;
To be aware that nutrition support is integral part of treatment of critically ill obese patient;
To know the protein requirements of obese patient who needs nutritional support.

Content

1. Characteristic of risks connected with severe obesity
2. Complications connected with surgery and acute illness in severely obese patient
3. Nutrition intake in severely obese patient
   3.1 Energy intake
   3.2 Protein and amino acid intake
4. Monitoring of nutritional support in severely obese patient

Key Messages

Mobilization of energy reserves is impaired in critically ill and severely obese patient;
Critical situation leads to muscle wasting in normally nourished as well as in severely obese patient. Muscle wasting severely complicates weaning from ventilator, wound healing and increases rate of complications;
Energy intake in severely obese patient needs nutritional support which should be adjusted to his or her adjusted body weight;
Protein intake in critically ill obese patient is 1.5-2 g/kg ideal body weight per day.

Topic 7 Enteral/Parenteral Nutrition - Substrates

Module 7.1 Substrates for Enteral and Parenteral Nutrition

Learning Objectives

To explain the metabolic effects of very low or very high energy intake during nutritional support;
To characterize the energy needs during enteral and parenteral nutrition;
To distinguish the difference between energy needs in stable and critically ill patient.

Content

1. Introduction
2. Energy
3. Macronutrients
   - 3.1 Carbohyrdates
   - 3.2 Amino Acids
   - 3.3 Lipids
4. Micronutrients and Vitamins
5. Water and Electrolytes
6. Fibres for EN
7. PN formulas and lipid emulsions
8. Addition of special substrates

Key Messages

Energy needs should be determined in relation to expenditure, but also to the ability of a patient to metabolize substrates correctly;
Most hospitalized patients present a combination of stress and malnutrition. Their energy expenditure is often lower than values obtained from classical equations and textbook tables. The vast majority of patients, including those in ICU, have energy expenditures, which do not exceed 2000 kcal/d;
Aiming at achieving positive or zero nitrogen balance via hypercaloric support should be discouraged during the acute metabolic phase of sepsis or trauma;
Overfeeding during acute illness may be associated with major complications and side effects;
The target should consist of preserving function and limiting major depletion of lean body mass by starting nutritional support at an early stage, but with limited amounts of energy substrates;
Hence, partial (under) feeding is acceptable during the hypermetabolic phase, while increased energy intakes may be useful in the recovery or anabolic phase of illness when tissue rebuilding is possible.

Module 7.2 Immunonutrition in Enteral and Parenteral Nutrition

Learning Objectives

To understand what is meant by the term immunonutrition;
To discriminate between advantages and limitations of immunonutrition;
To select immunonutrition according to the patient's pathology;
To integrate the individual action of immunonutrition in an overall nutritional strategy;

To understand the importance of anti-oxidant defence in immune function.

Content

1. Immunonutrients
2. Influence of oxidants on cytokine production
3. Antioxidants
4. Glutathione
5. Glutamine
6. Arginine
7. Nucleotides
8. Polyunsaturated fatty acids

Key Messages

Nutrient status has the potential to modulate cytokine biology and immune function;
Inflammation may inhibit T lymphocyte function;
Nutrients may act at many cellular locations, affecting cytokine production and altering the response of target tissues to cytokines;
Fatty acids can exert a direct influence by changing membrane phospholipid fatty acid composition;
Nutrients, which influence antioxidant defence, may alter cytokine production indirectly by modulating the extent of activation of transcription factors by oxidant molecules that are produced during the inflammatory response;
Recent, animal, and human studies concerning several nutrients that are relevant for the modulation of immune functions. Many of the preclinical data support a strong modulating role for glutamine, arginine, nucleotides and PUFAs;
However, data from human studies are still limited and have shortcomings. Further trials are needed to determine more precisely the mechanisms of action of these nutrients and their specific effects in different pathologies.

Topic 8 Approach to Oral and Enteral Nutrition (EN)

Module 8.1 Indications and Contraindications for Enteral Nutrition

Learning Objectives

To appreciate the different routes by which enteral nutrition can be delivered;
To understand the indications for and contraindications to enteral nutrition;
To identify the indications and benefits of enteral tube feeding;
To select an appropriate enteral feeding solution;
To recognize key characteristics associated with the delivery of enteral tube feeds;
To characterize complications associated with enteral nutrition.

Content

1. Indications for enteral nutrition
2. Contraindications to enteral nutrition
3. Routes for enteral tube feeding
4. Choice of feeding solution

Key Messages

A selection of commercially produced enteral feeding solutions is widely available;

The most suitable solution should be selected on an individual basis and it should be delivered as high up the GI tract as possible while ensuring maximum absorption.

Module 8.2 Oral and Sip Feeding

Learning objectives

To do the best to encourage the patient for oral nutrition, as the feeling of hunger decreases or disappears in any disease process;
To persuade the patient that oral nutrition is a challenge for a patient and his efforts are rewarded and there is a real curative result;
If oral nutrition fails then enteral and parenteral nutrition must be conducted until the patient is able to take nourishing food;
To understand the advantages of applieing nutritional supplements and their adjustment to the needs of patient.

Content

1. Introduction
2. Pathophysiology
3. Factors which have impact on oral nutrition
4. Basic situations and definitions
5. Directions for nutritional resources appliance
6. What are the nutritional substances that could be applied in enteral nutrition?
7. Sip feeds
8. Nutritional mixtures

Key Messages

Patient's oral nutrition is very often a therapeutical challenge, as the feeling of hunger decreases or disappears in any disease process;
All nutritional diets decrease the quantity and the quality of the food which leads to monotony and decreases the appetite for the allowed foods;
Oral nutritional supplements, the indications for their use and the way of their appliance allows the doctor to use the nutritional supplement that is most suitable for the needs of the patient and that would make him follow the nutritional regime;
As nutritional supplements contain a big amount of nutritional components they should be considered as drugs but they have to be adapted as much as possible to the taste and the needs of the patient as well;
Nutritional supplements must be prescribed after the relations benefit - price and effectiveness price.

Module 8.3 Techniques of EN

Learning Objectives

To explain the indication and benefits of percutaneously inserted feeding tubes;
To identify the possible limitations and complications of this method;
To identify the different surgical techniques;
To know the pros and cons of the different techniques;
To understand the advantages of needle catheter jejunostomy.

Content

1. Transnasal access
   1.1 Indication
   1.2 Contraindication
2. Feeding tube
3. Insertion technique
   3.1 Complication
   3.2 Delivery of nutrients
4. Monitoring
5. Endoscopic access (PEG and PEJ)
6. Percutaneous endoscopic gastrostomy (PEG)
   6.1 Indication
   6.2 Contraindications
   6.3 Complications
7. PEG-jejuno-feeding-system (PEG-J)
8. Gastrostomy
   8.1 Complications
9. Needle catheter jejunostomy
   9.1 Technique
   9.2 Complication
10. Enteral Feeding Pumps
11. Feeding Tubes
12. Delivery Systems
13. Handling and re-use

Key Messages

PEG and PEG-J are widely used. PEG, particularly, is easy to perform, with low procedure related complications. The most widely used method is the pull-procedure;
Neurological swallow impairment, neoplasm of the upper gastrointestinal tract, trauma and perioperative feeding in oropharyngeal surgery are the major indications;
Contraindications are rare. If the tubes are carefully managed the complications are minor;
PEJ is difficult to perform and is still under development;
Several surgical techniques for long-term feeding are available for those occasions, when endoscopic techniques are not possible;
Compared to endoscopic techniques, operative procedures have higher morbidity and mortality rates. Needle catheter jejunostomy is easy to perform after major surgery or laparoscopically and has less problems than other surgical techniques;
The success of enteral tube feeding depends on close co-operation between the clinical staff and the patient;
Nutritional principles must be observed while providing the regimen best suited to the individual needs of each patient.

Module 8.4 Diets for EN

Learning Objectives

To know the basic sources of nutrients which can be used for preparation of diets;
To know special disease specific formulas;
To be familiar with rules of preparation of home made enteral nutrition.

Content

1. Oligomeric and monomeric formulas

1.1 Monomeric formulas
1.2 Oligomeric formulas
2. Special formulas (disease specific)
2.1 Liver formulas
2.2 Renal formulas
2.3 Gastrointestinal (GI) dysfunction formulas
2.4 Stress and immunomodulatory formulas
2.5 Pulmonary formulas
2.6 Diabetes formulas
3. Industrial nutritional mixtures
4. Nutritional mixtures prepared in hospital

Key Messages

The effectiveness and the tolerance of enteral nutrition depend on the quality of the nutritional mixture;
Two types of nutritional mixtures are used: industrial (with standard contents and preliminarily made) and industrialised mixtures (produced immediately before their use);
Both types of mixtures complement one another and are produced for two different kinds of patients;
Industrial mixtures are suitable for patients with stable indices and industrialised mixtures are given to patients who are more unstable and for whom the import has to be more precise depending on their disease;
In any case the choice must be made by specialists including a doctor and a pharmacist.

Module 8.5 Monitoring and Complications of EN

Learning objectives

To have a practical understanding of how to monitor nutritional support in normal clinical practice;
To know how to develop and organise a monitoring programme;
To know the basic types of complications connected with tube feeding;
To be able to prevent complications of enteral nutrition.

Content

1. Aims and objectives
2. During acute illness
2.1 Convalescence from acute illness
2.2 Chronic illness or malnutrition
3. Integrated nutrition
4. Nutritional parameters
5. Clinical signs
6. Anthropometrics
7. Fluid balance charts
8. Laboratory data
9. Outcome data and audit
10. Gastrointestinal complications
10.1 Diarrhoea
10.2 Nausea and Vomiting
10.3 Constipation
11. Mechanical complications
11.1 Aspiration
11.2 Tube related complications

11.3 Tube clogging
12. Metabolic complications
13. Refeeding syndrome

Key Messages

Careful and effective monitoring is an indispensable part of nutritional support;
At present time majority of physicians relay primarily on monitoring of biochemical parameters;
The type and frequency of complications during EN may be related to the formulation and delivery of the diets, as well as the underlying disease;
There are three major categories of EN complications: gastrointestinal, mechanical and metabolic. GI complications are undoubtedly the most frequently described;
Careful consideration should be given to the use of enteral nutrition therapy, but once implemented, close monitoring of patients is an efficient safeguard against complications and side effects;
Similarly to the development of an enteral product formulary, standards of practice for delivery and monitoring of EN should be established and followed by all the staff involved in nutritional therapy.

Topic 9 Approach to Parenteral Nutrition (PN)

Module 9.1 Indications and Contraindications for Parenteral Nutrition

Learning Objectives

To be aware that total parenteral nutrition can be used as feeding method for long time period;
To understand the indications for parenteral nutrition;
To know contraindications for parenteral nutrition.

Content

1. Characteristic of parenteral nutrition as method for nutritional support
2. Characteristics of long term and short term parenteral nutrition
3. Indications for short term parenteral nutrition
   3.1 Peripheral parenteral nutrition
   3.2 Central parenteral nutrition
4. Indications for long term and home parenteral nutrition
5. Contraindications for parenteral nutrition

Key Messages

Parenteral nutrition can be used as feeding method in the cases when enteral route of nutritional support cannot be used (e.g. intestinal failure) or when enteral nutrition is contraindicated (e.g. intestinal obstruction);
Parenteral nutrition can be used during short term period and also during long term period. Home parenteral nutrition can be successfully used during very long term period (tens years);
Parenteral nutrition is contraindicated if patient has functioning gut sufficient to meet nutritional needs;
Contraindication of parenteral nutrition are considered when ethically problematic (e.g. terminal care).

Module 9.2 Techniques of PN

Learning Objectives

To know the indications and contraindications for peripheral parenteral nutrition;
To learn the rules of cannula insertion and management;
To understand the causes of complications and to learn the measures to avoid them;
To know various central venous access devices and routes for parenteral nutrition;
To know the basic principles of catheter insertion;
To learn the basic rules of catheter care.

Content

1. Peripheral vein and parenteral nutrition
   1.2 Indications for peripheral parenteral nutrition
   1.3 The advantages of PPN
2. Catheter or cannula insertion
3. Cannula management
4. Solutions and regimens for PPN
5. Complications
6. Central venous catheters (CVC)
   6.2 Catheter insertion
   6.3 Catheter aftercare

Key Messages

PPN has been developed for easy and safe PN and as an alternative to central PN, avoiding risks of central catheterization;
In fact this is not always true because less energy and protein can be infused than by central vein and serious complications may still occur;
It is a very attractive method for small hospitals, not experienced in parenteral nutrition. The majority of hospital patients can be fed successfully using a PPN formula of low osmolality made by dilution or a high fat content;
As always, it is necessary to consider benefits and risks and to follow precisely recommendations aimed at avoiding complications;
Central venous access is most often necessary for parenteral nutrition;
The right internal jugular vein for tunneled and right subclavian vein for non-tunneled catheters are the accesses of choice;
The catheter tip should be located under fluoroscopy in the upper caval vein just above the right atrium or the catheter position should be checked under x-ray after insertion;
When classical access to the upper vena cava is not possible, the catheter may be introduced via the femoral vein; alternatively, special small diameter catheters may be introduced via a peripheral vein;
Proper selection of the catheter, good insertion and quality of catheter aftercare are key factors for safe, successful and complication-free therapy.

Module 9.3 Compounding

Learning Objectives

To learn the basis for compounding nutritional formulas for parenteral nutrition;
To know basic disease-related formula composition;
To know basic rules of AIO compounding;

To know the rules for prevention of admixture instability and potentially dangerous consequences.

Content

1. Introduction
2. Procedures
3. PN admixture preparation protocol
4. Methods of PN admixture preparation
5. Stability of PN admixtures
6. Addition of special substrates

Key Messages

As parenterally fed patients must metabolize or excrete all infused nutrients, the composition of nutritional formulas should be adapted to nutritional requirements, metabolic capacity, metabolic disturbances and coexisting deficiencies or overloading;
Several examples of nutritional formulas for PN and the most common requirements associated with disease or altered nutritional status are presented briefly;
It is always necessary to understand the situation and to prescribe the formula most appropriate for a particular patient.

Module 9.4 Drugs and Nutritional Admixtures in PN

Learning Objectives

To understand important incompatibilities occurring upon drug admixing to PN;
To know general rules for drug administration in patients with PN.

Contents

1. Parenteral nutrition and drug therapy
2. Incompatibilities and interactions
3. Emulsion changes
4. Incompatibilities with the bag material
5. Inactivation of drugs or PN components
6. Degradation reactions leading to (potential) toxicity
7. Practical guidelines for drug therapy in PN patients

Key Messages

The use of AIO admixtures as drug vehicle in patients with PN is attractive but problematic because of the complex nature of these admixtures;
The most important incompatibilities between drugs and PN admixtures are presented. Specific emphasis is given concerning the properties of AIO admixtures (emulsion, chemical reactivity of the components, container material and potential adverse effects);
As a general guideline, admixing of drugs to AIO admixtures should be avoided were possible;
If inevitable for therapeutic and practical reasons a strict GMP protocol involving specific pharmaceutical knowledge, including analytical assessment, is important in order to achieve safe and effective nutritional and drug therapy;
Only selected drugs with accepted extended administration time, large therapeutic index, and appropriate physicochemical properties are candidates for admixing. Standardizations may help to facilitate institution-specific guidelines.

Module 9.5 Monitoring and Complications of PN

Learning Objectives

To have a practical understanding of how to monitor nutritional support in normal clinical practice;
To know how to develop and organize a monitoring programme;
To review the insertion, mechanical, infectious and thrombotic complications associated with central venous catheters;
To learn how to prevent them;
To recognize the symptoms and to know the basis of diagnosis and treatment of catheter related bloodstream infections;
To describe basic acute and long term metabolic complications connected with parenteral nutrition;
To raise awareness that metabolic complications may arise from administration of inadequate or excessive nutrients;
To become familiar with criteria to define clinically relevant metabolic complications and the substrates involved;
To be able to implement protocols for prevention and surveillance of metabolic complications.

Contents

1. Introduction
2. Aims and objectives
   - 2.1 During acute illness
   - 2.2 Convalescence from acute illness
   - 2.3 Chronic illness or malnutrition
3. Integrated nutrition
4. Parameters
5. Nutritional parameters
6. Anthropometrics
7. Fluid balance charts
8. Laboratory data
9. Outcome data and audit
10. Early complications
11. Late mechanical complications
    - 11.1 Thrombosis
    - 11.2 Septic complications
12. Pathogenesis
13. Prevention
14. Diagnosis and treatment
15. Complications due to nutrient deficiencies
16. Hypoglycaemia
17. Hypophosphataemia
18. Metabolic complications from overfeeding
19. Biochemical monitoring
20. Long-term metabolic complications
    - 20.1 Liver steatosis
    - 20.2 Cholestatic liver disease
    - 20.3 Cholelithiasis and acalculous cholecystitis
    - 20.4 Bone disease

Key Messages

Careful and effective monitoring is an indispensable part of nutritional support;
At present time majority of physicians relay primarily on monitoring of biochemical parameters. However intelligent and systematic monitoring and interpretation of clinical data in relation to ongoing pathology is indispensable part of treatment;
CVC related complications may cause serious clinical problems during insertion, maintenance or after CVC removal;
Early-insertion related and late-mainly infectious and thrombotic complications should be considered. A thorough knowledge of the etiology and of preventive rules is essential for proper prophylaxis, diagnosis and management;
Parenteral nutrition can be complicated by many metabolic problems, which may arise from inadequate or excessive amounts or from an inappropriate composition of nutrients;
The most severe complications are cholestatic liver disease and bone disease;
In every day practice, it is difficult to ascertain every patient nutrient requirements, hence nutrition support must be closely monitored and adjusted to the patient's metabolic profile.

Topic 10 Nutritional Support in Pediatric Patients

Module 10.1 Enteral Nutrition in Pediatric Patients

Learning Objectives

To understand the physiological importance of enteral nutrition for the children of all ages;
To understand the physiological characteristics of neonatal gastrointestinal system that determine the need of special nutritional support;
To summarize the specific elements of nutritional management in the neonates (preterm and term) and older children.

Content

1. Physiological impact of enteral feeding
2. Enteral nutritional support in preterm and term neonates
   - 2.1 Indications
   - 2.2 Goals
   - 2.3 Substrates
   - 2.4 Routes and rates of enteral nutrients administration
   - 2.5 Hazards and possible complications
   - 2.6 Parenteral nutritional support
3. Enteral nutritional support in older children
   - 3.1 Indications
   - 3.2 Technical aspects of enteral nutritional support
     - 3.2.1 Tubes and routes of placement
     - 3.2.2 Rates of nutrient administration
   - 3.3 Specialized enteral feeding compositions
   - 3.4 Complications

Key Messages

Presence of nutritional substrates in the intestinal lumen is very important for the intestinal cells conditioning;
This way it is a key factor for the absorption and barrier functions, motility and hormone production in the gastrointestinal system;

Immaturity of gastrointestinal functions as well as sucking and swallowing reflexes determine the special needs for nutritional support of the preterm neonates;
Substrates, used for enteral nutritional management have a great impact on the growth and development of the preterm and term neonates;
Human milk is considered as golden standard for enteral nutrition of neonates and is always recommended if possible;
Principles of enteral nutritional support in older children are similar to the adults.

Module 10.2 Parenteral Nutrition in Pediatric Patients

Learning Objectives

To define the principles and indications for PN in children;
To summarize the physiological characteristics of the children in different ages and their influence on PN;
To give age appropriate standard schemes for nutrient dosage;
To give age appropriate standards for metabolic monitoring;
To discus the reasons and mechanisms of possible complications. To give recommendations for prevention;
To give practical tips for drawing up age appropriate balance of nutrients, water and electrolytes.

Content

1. Basic principles of parenteral nutrition (PN)
   - 1.1 Indications for PN
   - 1.1 When to start PN?
2. Some technical aspects of PN
3. Elements of PN
   - 3.1 Carbohydrates - Glucose
   - 3.2 Protein - Amino acids
   - 3.3 Lipids
   - 3.4 Vitamins
   - 3.5 Trace elements
   - 3.6 Electrolytes
   - 3.7 Water
4. Monitoring of PN
   - 4.1 Blood glucose
   - 4.2 Plasma triglyceride concentration
   - 4.3 Urine analysis
   - 4.4 Nitrogen balance
   - 4.5 Urea, creatinine, AST, ALT, AP and bilirubin
   - 4.6 Plasma Total protein and Albumin
5. Complications of PN
   - 5.1 Catheter related complications
   - 5.2 Metabolic complications of PN
   - 5.3 Hepatobiliary complications
6. Drawing up the plan for PN
   - 6.1 Estimation of energy needs
   - 6.2 Macronutrient dosage
   - 6.3 Vitamin and trace element dosage
   - 6.4 Water and electrolyte balance
   - 6.5 Gradual adaptation

Key Messages

Parenteral nutrition (PN) of pediatric patients is based on the same principles as in the adults;
Along with metabolic recovery and maintenance PN must provide sufficient amounts of protein and energy for growth and development of the children of all ages;
Nutrition body stores (fat and muscle tissue) in Neonates and especially premature/Low Birth weight (LBW) are much lower than in the adults. That's why they are very sensitive to the deficit of protein and energy;
Macro and micro nutrient balance is made according to standard, age appropriate schemes. Metabolic monitoring is used to personalize it for each patient;
Compared with the adults the greatest anatomical and physiological differences are found in term and preterm neonates. These differences concern all organs and systems.

Module 10.3 Nutritional Support in Pediatric ICU Patient

Learning Objectives

To understand the main physiological principles of metabolic stress response in pediatric patients;
To understand principles of building up adequate nutritional support strategy for pediatric ICU patients of different ages.

Content

1. Metabolic changes in critical conditions
   - 1.1 Regulation
   - 1.2 Pathophysiological pathways
   - 1.3 Substrate utilization
2. Estimation of nutritional needs
   - 2.1 Energy
   - 2.2 Proteins
3. Enteral nutritional support
   - 3.1 Indications
   - 3.2 Routes and rate of administration
   - 3.3 Specialized formula
   - 3.4 Monitoring of enteral nutritional support
   - 3.5 Complications of enteral nutritional support
4. Parenteral nutritional support
   - 4.1 Indications
   - 4.2 Route of administration
   - 4.3 Fluid and electrolyte balance
   - 4.4 Macronutrients
   - 4.5 Vitamins and trace elements
   - 4.6 Technical aspects of parenteral nutrition
     - 4.6.1 Venous access
     - 4.6.2 Rate of nutrient administration
   - 4.7 Monitoring of parenteral nutritional support
   - 4.8 Complications of parenteral nutritional support
5. Immune nutrition
6. Antioxidants

Key Messages

In spite of the great variety of reasons that can cause critical states, initial physiological stress response and metabolic changes that take place later are similar in the most critical

conditions;
Enhanced production of stress hormones, mediators and other physiologically active substances cause increased energy expenditure and catabolism of body proteins;
Adequate nutritional support aims to minimize own tissue catabolism and to prevent dysfunction of cardiovascular, respiratory and immune function;
Optimal nutritional support is based on correct estimation of patient overall condition, water, electrolyte and substrate requirements concerning the age specific physiological characteristics;
Requirements for growth and organ development should be considered in nutrition management of pediatric ICU patients;
Enteral nutrition, even in minimal amounts, should be considered always when possible.

Topic 11 Organization of Nutritional Care. Ethic and Legal Aspects

Module 11.1 Organization of Nutritional Care (NST)

Learning Objectives

To appreciate the problem of disease related malnutrition;
To understand that it is often failure of organization and implementation which is the main barrier to improving nutritional care;
To be able to develop organizational models, protocols and systems to coordinate a multidisciplinary approach to nutritional care.

Content

1. Introduction
2. Policy, standards and protocols
3. Hospital food and catering
4. Education and training
5. Dietetics
6. Nutritional support teams
7. Purchasing and equipment

Key Messages

Improved organization of nutritional care will have both clinical and economic benefits in the hospital service;
Tucker has shown that two days earlier intervention saves one day in hospital and has calculated potential savings of one million dollars a year in the average American Hospital;
Certain groups e.g. the elderly and those with chronic disease are at risk of malnutrition in the community and should also be identified and treated;

Module 11.2 Ethic and Legal Aspects

Learning Objectives

To understand the principle of medical ethics;
To appreciate how these affect the practice of nutritional care;
To appreciate some legal aspects of this practice.

Content

1. Introduction
2. Beneficence and non maleficence
3. Autonomy
4. Special situations
5. Malignant disease
6. Motor neuron disease (MND)
7. Dementia

Key Messages

Ethical and legal considerations increasingly influence clinical decisions;
Increased complexity of decisions in our technical and medico-legal climate in which the patient is better informed;
The physician's first duty is to the patient (beneficence, non maleficence) but he or she also has a duty to society (Justice);
It is the responsibility of society as a whole to decide what resources are to be devoted to health care after full and public discussion and consultation;
The patient's autonomy must be respected but no physician can be forced to undertake treatment that is futile or that he or she considers against the patient's interest;
The interest of the individual must however be protected against arbitrary action or decisions by government, purchasing bodies, insurance companies or individuals by a Bill of Rights which is safeguarded by the courts acting independently of government;
Care of the sick entails the basic duty of providing adequate and appropriate fluid and nutrients by mouth;
As long as a patient can swallow and expresses a desire or willingness to drink or eat, fluid and nutrients should be given provided that there is no medical contraindication. This is basic care. Artificial feeding by tube or by vein is a medical treatment.

Topic 12 Nutritional Support in Gastrointestinal Diseases - Compromised Gut

Module 12.1 Nutritional Support in Extensive Gut Resections (short bowel)

Learning Objectives

To recognize the impact of extensive small bowel resection on digestion, absorption and metabolism;
To understand that the consequences of a resection differ depending on the function and extent of the removed segment, e.g. resection of ileum with the ileo-caecal valve, is more deleterious than resection of the jejunum;
To understand, recognize and treat secondary conditions related to small bowel resection including: diarrhea, malabsorption of macro- and micronutrients, hypersecretion of gastric acid, bacterial overgrowth, and development of oxalate renal stones and cholesterol gallstones, and metabolic acidosis;
To understand the nutritional goals for patients with SBS and the role of enteral nutrition in structural and functional adaptation in the small bowel remnant.

Content

1. Etiology
2. Pathophysiology
3. Complications of SBS

3.1 Gastric acid hypersecretion
3.2 D-lactic acidosis
3.3 Nephrolithiasis
3.4 Cholelithiasis
3.5 Liver function disorders
4. Small bowel adaptation
5. Management of SBS
6. Dietary management of SBS
7. Fluid and electrolytes
   7.1 Sodium
   7.2 Potassium
   7.3 Magnesium
   7.4 Calcium
   7.5 Water
8. Macronutrients
   8.1 Carbohydrates
   8.2 Fat
   8.3 Protein
   8.4 Alcohol
9. Micronutrients
10. The role of the dietitian in SBS

Key Messages

Short bowel syndrome (SBS) is characterized by diarrhea, fluid and electrolyte depletion, malabsorption of nutrients, and weight loss;

After resection of the jejunum, the ileum is able to assume most absorptive functions; therefore resection of the ileum is metabolically more detrimental;

Removal of the ileo-caecal valve causes a further shortening of intestinal transit time and increases the risk of retrograde bacterial colonization of the small intestine;

Careful fluid end electrolyte replacement and nutritional therapy play a critical role in the treatment of SBS;

In most cases parenteral nutrition is necessary, in the early stages, to prevent malnutrition, but, as soon as possible, enteral and oral nutrition should be started and TPN reduced as far as possible;

Enteral nutrition stimulates bowel function and intestinal adaptation;

In some patients long-term parenteral, combined with oral or enteral nutrition, becomes necessary and is provided at home.

Module 12.2 Nutritional Support in Gastrointestinal Fistulas

Learning Objectives

To recognize the impact of GI fistulas at different levels on digestion, absorption and metabolism;

To understand the role of nutrition and metabolic care in the spontaneous healing of fistula;

To understand the role of enteral nutrition in maintaining intestinal integrity, reducing infection rate and decreasing bacterial translocation.

Content

1. Introduction
2. Principles of management
3. Approach to fistula management

Key messages

The therapeutic goals in the management of postoperative EC fistulas are: closure of the fistula and reestablishment of intestinal continuity;
Achieving of these goals is not easy, and often impossible in the malnourished patient who has been operated on a short period before the onset of fistula;
Treatment of fistulae is complex and based on bowel rest, enteral nutrition if possible, but parenteral nutrition if not, pharmacological suppression of secretion, suction drainage, physical rehabilitation and careful monitoring of all vital functions;
Whenever possible enteral nutrition should be introduced at least as a part of nutritional support;
Elective surgery should be considered if after 3-5 weeks of nutrition support spontaneous closure has not occurred;
Emergency surgery is indicated in patients who developed uncontrolled sepsis, or severe hemorrhage.

Module 12.3 Nutritional Support in Inflammatory Bowel Diseases

Learning Objectives

To recognize nutritional and metabolic derangements in inflammatory bowel disease (IBD);
To learn nutritional monitoring in IBD;
To identify indications for nutritional support;
To perform enteral and parenteral nutrition in patients with IBD.

Content

1. Effect of inflammatory bowel disease on nutritional status and metabolism
2. Indication for nutritional support
3. Nutritional support
4. Treatment and prevention of malnutrition
5. Dietary recommendations
6. Enteral and parenteral nutrition in chronic pancreatitis

Key Messages

The active phase of inflammatory bowel disease frequently leads to protein energy malnutrition, which in children can lead to growth retardation. Furthermore, specific deficits of vitamins, Fe and Ca have been described in some patients;
Regular nutritional monitoring is, therefore, warranted in all patients with IBD;
Nutritional support is indicated to prevent and treat malnutrition;
Dietary counselling is less effective, therefore sip feeding with standard polymeric diets or tube feeding are necessary;
Tube feeding may be performed overnight to allow normal oral nutrition by day;
Patients can either swallow a tube every evening, or a PEG may be safely inserted, even in Crohn's disease;
Intravenous supplementation of vitamins and iron may be necessary in patients with deficiencies due to reduced absorption or limited tolerance of oral supplements;
Adequate nutritional support improves quality of life in IBD patients;
Enteral and parenteral nutrition are also effective in treating an active phase of Crohn's disease and are therefore an alternative to medical treatment in patients who are intolerant to or unwilling to take steroids;
In patients with chronic active CD sip feeding seems to allow reduction in steroid dosage and reduces disease activity;

An elimination diet is helpful in maintaining remission. The role of pharmaconutritients is still controversial.

Module 12.4 Nutritional Support in Acute and Chronic Diarrhoea

Learning objectives

To learn about the different aetiologies of acute and chronic diarrhoea;
To be able to diagnose diarrhoea appropriately;
To learn about the different treatment options of diarrhoea.

Contents

1. Aetiologies of infectious diarrhoea (viral, bacterial, parasites)
2. Aetiologies of non-infectious diarrhoea
3. Diagnosis of diarrhoea
4. Management of acute and chronic diarrhoea
5. Prevention of diarrhoea
6. The role of pre- and probiotics in diarrhoea

Key messages

Diarrhoea is major health problem in developing countries;
Diarrhoea is a symptom of different aetiologies;
Most common are viral and bacterial infections. Antibiotic treatment, enteral tube feeding, diseases involving damage to mucosal lining and endocrinopathies are further important causes of diarrhoea;
Acute diarrhoea is often a self-limited disease and requires only oral rehydration therapy;
The administration of soluble-fermentable fibre enhances colonic sodium and water absorption;
ORS formulation supplemented with soluble fibre are effective in acute and chronic diarrhoea;
Probiotics are effective in the prevention and treatment of diarrhoeal diseases.

Module12.5 Nutritional Support in Irritable Bowel Syndrome (IBS), Constipation

Learning objectives

To describe the pathogenesis of the different types of the clinical patterns of IBS;
To understand the importance of food components and intestinal motility;
To understand the limits of dietary treatments in IBS;
To be able to understand the different types of constipation (primary idiopathic constipation, secondary constipation);
To understand the role of fibre in the pathogenesis of constipation;
To be able to recommend an appropriate nutritional treatment.

Contents

1. Definition of IBS
2. Pathogenesis of IBS
3. Diagnostic work up of IBS
4. Nutritional intervention in IBS
5. Limits and outlook in the treatment of IBS
6. Definition of different types of constipation
7. Pathogenesis of constipation

8. Diagnosis of constipation
9. The role of fibre intake and constipation
10. Treatment of constipation
    10.1 Dietary recommendation
    10.2 Laxatives
    10.3 Drugs

Key messages

The pathogenesis of IBS is still difficult to understand;
IBS is an intestinal motility disorder with abdominal pain in stool irregularities (constipation, diarrhoea, or a combination of both);
Food components can play a role in causing symptoms;
Diagnosis can be made using the Rome II criteria;
Dietary treatment of IBS is of limited effect;
Constipation is a common disease with a predominance in women;
Constipation is not a unique disease, different mechanisms are involved;
Diagnosis of chronic constipation can be made by the Rome II criteria;
Fibre intake is only one component in the pathogenesis;
Different treatment options are recommended in different types of constipation;
Increase in fibre intake results only in a modest improvement in constipated patients.

Module 12.6 Nutritional Support in Diverticulosis

Learning objectives

To understand the clinical impact of the presence of diverticulosis;
To know the complications of diverticulosis;
To be able to manage patients with diverticulitis and other complications.

Contents

1. Epidemiology of diverticulosis
2. Pathogenesis of diverticulosis
3. Fibre hypothesis and diverticulosis
4. Clinical presentation of diverticulosis
5. Complications of diverticulosis
6. Management of diverticulosis complications
7. Dietary management of diverticulosis and complications

Key messages

Diverticulosis is common and the prevalence increase with age;
Most of the time diverticulosis causes no symptoms (only about 20% of patients with diverticulosis have symptoms);
Common complication of diverticulosis are diverticulitis and less more common bleeding;
Fibre rich diets can be used to reduce symptoms and may be to reduce diverticula formation;
Recurrent diverticulitis attacks should be treated by surgery.

Topic 13 Nutritional Support in Liver Disease

Module 13.1 Nutritional Support in Acute Liver Disease, including Liver Failure

Module 13.2 Nutritional Support in Chronic Liver Disease, including Liver Failure

Learning Objectives

To identify protein-energy malnutrition as a common complication in patients with liver cirrhosis;
To be familiar with methods of nutritional support in liver disease;
To explain the basic principles of nutrition therapy in acute liver diseases;
To know recommendations for nutritional therapy of chronic liver diseases.

Content

1. Oral diet
2. Dietary supplements
3. Supplemental sip feeding
4. Branched chain amino acids (BCAA)
5. Micronutrients
6. Enteral feeding
7. Parenteral nutrition
8. Conclusions for diagnosis related nutritional therapy
9. Alcoholic hepatitis
10. Compensated cirrhosis
11. Cirrhosis with encephalopathy
12. Perioperative nutrition in chronic liver disease
13. Nutrition in acute hepatic failure
14. Nutrition and liver transplantation

Key Messages

Regardless of cause, acute liver injury is often associated with anorexia, nausea and vomiting;
Nutritional complications are frequent in chronic liver injury;
Protein-energy malnutrition and vitamin deficiency is very common in chronic liver disease and negative nutrient balance due to inadequate intake is frequent;
Thus, instead of imposing restrictive diets, which may be harmful, the goal of nutritional therapy is to ensure adequate provision of energy, nitrogen and micronutrients to improve nutritional state.

Topic 14 Nutritional Support in Pancreatic Disease

Module 14.1 Nutritional Support in Acute Pancreatitis

Module 14.2 Nutritional Support in Chronic Pancreatic Diseases

Learning Objectives

To be able to describe the physiology and pathophysiology of pancreatic secretion and consequences for nutrient digestion;

To become familiar with the method of fluid resuscitation in acute pancreatitis;
To recognize the potential benefits and limitation of early enteral or parenteral nutritional interventions in patients with acute pancreatitis;
To be able to give nutritional recommendations in patients with chronic pancreatitis.

Content

1. Introduction
2. Acute pancreatitis
3. Physiology and pathophysiology with respect to fluid resuscitation
4. Early fluid resuscitation in acute pancreatitis
5. Physiology and pathophysiology with respect to nutrition
6. Consequences for nutritional support
7. Recommendations
8. Chronic pancreatitis
9. Dietary recommendations
10. Enteral and parenteral nutrition in chronic pancreatitis

Key Messages

The past clinical emphasis on the need for "gut rest" in order to decrease pancreatic stimulation has to be revised. The nutritional management of patients with acute pancreatitis is now guided by five main principles:

- to start with intensive fluid replacement therapy,
- to reduce pancreatic stimulation to subclinical levels to maintain gut integrity,
- to attenuate the overall systemic inflammatory response,
- to avoid iatrogenic complications (e.g. catheter-related sepsis);

Fluid resuscitation is necessary in any form of acute pancreatitis;
Aggressive nutritional enteral or parenteral support is not required for mild to moderate forms of acute pancreatitis;
The use of early enteral feeding in patients with severe disease can decrease the incidence of nosocomial infections, the duration of the systemic inflammatory response and the overall disease severity. Therefore if tolerated, early enteral nutrition is strongly recommended in these patients;
When the nutritional goal cannot be achieved by using enteral nutrition, parenteral nutrition must be instituted. This can be combined with small amounts of enteral nutrition. The use of lipid emulsion in TPN was shown to be safe without aggravation of the disease;
Dietary recommendations, pancreatic enzyme supplements and fat-soluble vitamins are the cornerstones of the nutritional management of chronic pancreatitis;
The diet should consist of carbohydrate and protein, but to reach the caloric goal fat must be given. 50-100g.d^{-1} is often tolerated. However, if steatorrhoea is present a reduction to 50-70g.d^{-1} is necessary. MCT can also be tried in this situation. Only a minority of patients need enteral or parenteral nutrition.

Topic 15 Nutritional Support in Renal Diseases

Module 15.1 Nutritional Support in Acute Renal Diseases including Renal Failure

Learning objectives:

To know the metabolic changes connected with acute renal failure;
To understand the macronutrient metabolism in patients with acute renal failure;

To be aware of treatment strategy in acute renal failure;
To know nutritional strategy during acute renal failure.

Content:

1. Acute renal failure in sepsis, trauma or multiple organ failure
2. Metabolic aspects of acute renal failure
3. Protein metabolism in acute renal failure
4. Lipid and carbohydrate metabolism in acute renal failure
5. Nutritional goals in critically ill patient with acute renal failure

Key messages

Acute renal failure is usually complication of other disease such as sepsis, trauma or multiple-organ failure;
The uremic state plus the underlying disease process determine metabolic changes in acute renal failure;
Acute renal failure is characterized by a profound activation of protein catabolism with stimulation of hepatic gluconeogenesis and ureagenesis and by impaired glucose and lipid metabolism;
The aim of nutritional treatment is not alleviation of uremic toxicity and retardation of progression of renal disease but the stimulation of immunocompetence, of wound healing and other reparative functions;
In most clinical situations, requirements exceed the minimal intake recommended for stable renal failure patients or the recommended daily allowances for normal subjects;
Patients with acute renal failure present an extremely heterogeneous group of subjects with widely differing nutrient requirements and individual requirements can vary considerably during the course of disease;
The optimal intake of nutrients in acute renal failure is influenced more by the nature of the illness, the extent of catabolism and type and frequency of renal replacement therapy.

Module 15.2 Nutritional Support in Chronic Renal Diseases including Renal Failure

Learning objectives:

To understand the metabolic abnormalities in patients with renal disease;
To know the determinants of nutritional state and the causes of malnutrition in uraemia;
To be aware of the aims of nutritional therapy and the type and composition of substrates in chronic renal failure without dialysis treatment.

Content:

1. Metabolic changes connected with chronic renal failure
2. Etiology of malnutrition in patients with chronic renal failure
3. Energy, carbohydrate and lipid intake in chronic renal failure
4. Protein intake in chronic renal failure
5. Protein and amino acid supplements in chronic renal failure

Key messages

The patients with chronic renal disease, are at a high risk of malnutrition, because of uraemia associated factors, metabolic acidosis and concurrent disease;
Impaired appetite, gastrointestinal side effect of uraemia, and potentially ill directed dietary regimens can also cause inadequate oral food intake;

The purpose of nutritional management is to prevent malnutrition at an early stage of renal disease;
Nutritional management should also:

- reduce accumulation of waste products
- prevent development of cardio-vascular disease by treating hyperlipidaemia
- prevent development of bone disease by treating vitamin D deficiencies and hyperparathyroidisms
- retard progression of renal dysfunction;

Compensation of metabolic acidosis by bicarbonate supplementation must not be forgotten in these patients.

Module 15.3 Renal Replacement therapy (Haemodialysis)

Learning objectives:

To know the methods of chronic renal replacement therapy;
To understand the metabolic changes connected with haemodialysis and chronic ambulatory peritoneal dialysis;
To know the nutritional requirements in patients on chronic renal replacement therapy.

Content

1. Methods of chronic renal replacement therapy
2. Metabolic consequence of chronic haemodialysis
3. Metabolic effect of chronic ambulatory peritoneal dialysis
4. Etiology of malnutrition in patients on chronic renal replacement therapy
5. Requirements of macronutrients in patients on chronic renal replacement therapy
6. Chronic renal replacement therapy and requirements of water, electrolytes and micronutrients.

Key messages

Patients on chronic renal replacement therapy (haemodialysis, chronic ambulatory peritoneal dialysis) are frequently malnourished or at extreme risk of developing malnutrition;
In patients on haemodialysis 10-13 grams of amino acids is lost the dialysate;
In chronic ambulatory peritoneal dialysis 89 g of protein are lost daily in the dialysate;
The loss of water-soluble vitamins is associated with chronic renal replacement therapy;
Renal replacement therapy is frequently connected with inflammatory process, activation of protein catabolism and increase in lipid peroxidation;
The aims of nutritional treatment during renal replacement therapy are:

- to prevent or treat malnutrition
- to reduce accumulation of fluid, waste products, potassium and phosphorus
- to prevent complications of uraemia (cardiovascular disease, bone disease etc.)

Topic 16 Nutritional Support in Injury and Sepsis

Module 16.1 Metabolic Changes in Injury and Sepsis

Learning Objectives

To understand how neural and endocrine responses mediate the metabolic response to injury;

To understand the implications of this for nutritional support;
To understand that pro-inflammatory cytokine production is a key part of the successful defeat of infection;
To understand the effects that cytokine production has upon metabolism;
To understand the dangers of excessive cytokine production, leading to tissue depletion;
To be aware that genetic factors influence cytokine production and it's consequences.

Content

1. Background
2. Neural stimuli and the sympathetic nervous system
3. Hypothalamus and pituitary
4. Adrenal cortex and thyroid
5. Insulin and glucagon
6. Endocrine effects on metabolism
7. Growth factors
8. Therapeutic implications
9. Endocrine changes during the inflammatory response
10. The immune response exerts a high metabolic and nutritional cost upon the body
11. Adverse effects of cytokines
12. Antioxidant defences are depleted by infection and trauma
13. Influence of genetics on the cytokine response

Key Messages

The neuroendocrine response to injury results in a rise in the secretion of the catabolic hormones cortisol, glucagon and catecholamines with insulin resistance, resulting in a diversion of substrates from non-essential tasks to those necessary for healing;
Additional changes are raised GH, reduced T3, increased T3R, reduced sex hormone secretion, raised prolactin, and activation of the RAAS;
Feeding alone cannot reverse the catabolic response, although it can reduce net tissue loss and maintain function;
Additional pharmacological measures, particularly the use of insulin, may diminish catabolism and improve outcome;
The pro-inflammatory cytokines IL-1, IL-6 and TNF-a are produced in response to a wide range of stimuli - infection, injury, surgery, cancer. They bring a powerful, purposeful and focused response aimed at defeating invading organisms and restoring body function to normal. Profound metabolic changes occur due their actions. The changes influence protein, fat, carbohydrate, energy and micronutrient metabolism and may precipitate a state of malnutrition;
While pro-inflammatory cytokine production is an essential part of the response to infection injury and surgery excessive production these molecules may result in increased morbidity and mortality;
Anti-oxidant defences become depleted during the response to cytokines increasing the risk of up-regulation of the inflammatory process and tissue damage;
Variations in genes controlling the level of cytokine production have been linked with increased morbidity and mortality.

Module 16.2 Nutritional Support in Sepsis

Learning Objectives

To be able to prescribe nutritional support in a critically ill or septic patients;
To know the recommended dosages of energy substrates in critically ill patients;
To acquire knowledge regarding new substrates used in critically ill patients.

Content

1. Introduction
2. Enteral versus parenteral nutrition
3. Energy supply
4. Glucose
5. Lipids
6. Amino acids
7. Vitamins and trace elements

Key Messages

The catabolic response to injury can be modified by treating and moderating its underlying cause but cannot be completely reversed by nutritional support;
Nutritional support can, however, eliminate starvation and minimize tissue loss as well as maintaining function and optimizing recovery;
Some part at least of nutritional intake should be enteral because of its superior effects on gut and immune function;
Parenteral nutrition should be used in the presence of gastrointestinal dysfunction.

Module 16.3 Nutritional Support in Trauma

Learning Objectives

To characterize metabolic changes specifically related to trauma;
To be able to prescribe nutritional support in trauma patients;
To be aware of new substrates used in trauma patients;
To characterize metabolic changes connected with severe head trauma and the consequences for nutritional support.

Content

1. Pathophysiology of trauma
2. Cardiovascular response
3. Inflammatory response
4. Metabolic response
5. Wound healing and nutrition
6. Timing and route of feeding
7. Energy needs and delivery
8. Severe head injury

Key Messages

Trauma is characterized by combination of cardiovascular, inflammatory and metabolic responses;
During the cardiovascular phase, priority is given to resuscitation and maintenance of vital functions;
Nutritional support is useful during the inflammatory and metabolic phase and improves the patient's outcome;
In trauma patients, post-pyloric feeding may be preferred to gastric feeding for the first 3 to 4 days after trauma;
Immune-enhancing enteral diets may be useful in severely injured subjects. In head-injured patients, specific attention should be given to control of intracranial pressure. For this purpose, overfeeding should be avoided.

Module 16.4 Nutritional Support in Burns

Learning Objectives

To know the principles of fluid resuscitation in burn patients;
To be familiar with requirements for macronutrients and micronutrients in burn patients;
To know the methods of administering nutrition in burn patients.

Contents

1. Pathophysiology
   - 1.1 Fluid loss
   - 1.2 Metabolic response
2. Treatment
   - 2.1 Fluid resuscitation
   - 2.2 Non-nutritional measures
3. Nutrition
4. Energy requirements
   - 4.1 Proteins
   - 4.2 Lipids
   - 4.3 Carbohydrates
   - 4.4 Vitamins, trace elements and minerals
5. Micronutrients functions in major burns
6. Nutracuetics in burns
   - 6.1 Glutamine and arginine
   - 6.2 ω-3 PUFA
   - 6.3 Immunomodulating diets (IMD)
7. Route of administration
   - 7.1 The parenteral route
   - 7.2 The enteral route
   - 7.3 Enteral access

Key Messages

Patients with major burns have increased nutritional requirements;
Energy requirements vary over time, with the largest increases being observed during the first weeks after injury;
Enteral nutritional is the first choice, but may be supplemented by PN if nutrient intake is inadequate;
Burned patients have increased trace element losses, which contribute to delayed;
Recovery: this can be reversed by early intravenous supplementation. Weight changes and energy intakes should be monitored daily.

Topic 17 Nutritional Support in the Perioperative Period

Module 17.1 The Stress Response and its Effects on Metabolism

Learning Objectives

Understand the mechanisms behind the stress response in surgical patients and how this may relate to impaired or enhanced recovery after surgery;
How does the surgical stress response lead to hypermetabolism;
What does this mean for protein metabolism;

How can certain aspects of the stress response and its effects on protein metabolism be avoided and how can it be treated;
Insights into the relationship between hypermetabolism, alterations in protein metabolism and complications in surgery.

Content

1. What is meant by the surgical stress response?
2. Clinical symptoms
3. How does hypermetabolism result from the surgical stress response?
4. Protein kinetics
5. Does the gut play a role?

Key Messages

The stress response after surgery is a useful phenomenon;
However, if uncontrolled, it leads to auto-cannibalism;
Reduction of magnitude of surgical impact or its effects may be useful (small incisions, epidural);
The counter regulatory hormones and inflammatory response to surgery cause insulin resistance;
Insulin is the main anabolic hormone;
To avoid catabolism, insulin resistance must be avoided;
Patients should not be fasted unnecessarily. Modern fasting guidelines recommend patients to drink clear fluids up until 2 hours and allow solids 6 hours before anesthesia and surgery;
Depleted patients should be replenished;
Albumin is not a measure of nutritional status.

Module 17.2 Insulin Resistance and Glucose Control

Learning Objectives

Understand the mechanisms behind insulin resistance (IR) and how this may relate to recovery;
How IR affects glucose metabolism;
How IR can be avoided and how it should be treated;
Insights to the relationship between hyperglycemia and complications in surgery.

Content

1. How insulin resistance develops
2. Metabolic and clinical outcomes from treating insulin resistance
3. Changes in glucose metabolism
4. Proactive approach to insulin resistance
5. Treating insulin resistance with insulin
6. Modern fasting guidelines

Key Messages

The counter regulatory hormones and inflammatory response to surgery cause insulin resistance;
Resistance to insulin develops within minutes and remains for days to weeks;
Insulin resistance is the cause of hyperglycemia;
Hyperglycemia increases complications and mortality in postoperative critically ill patients, and has been associated with prolonged length of stay in uncomplicated surgery;

Treatment with insulin during TPN to maintain normoglycemia also normalizes FFA levels, substrate oxidation and nitrogen losses;
Insulin resistance can be avoided or minimized by the use of epidural anesthesia and analgesia, minimal invasive surgery and by preoperatively preparing metabolism with carbohydrates instead of overnight fasting;
Preoperative carbohydrate loading as opposed to overnight fasting has been shown to reduce nitrogen losses, retain lean body mass and improve muscle strength;
If insulin resistance has developed and hyperglycemia is present, available data suggests that insulin should be given to keep blood glucose levels between 4.5 and 6.1 mM in post operative critically ill patients;
Modern fasting guidelines recommend patients to drink clear fluids up until 2 hours and allow solids 6 hours before anesthesia and surgery.

Module 17.3 Nutritional Support in the Perioperative Period

Learning Objectives

Understand the principles behind nutritional care for elective surgical patients;
Recognize key issues that allow restoration of oral food intake quickly and safely following major surgery;
Understand the specific issues surrounding provision of nutritional support for malnourished/complicated patients in the post-operative period.

Content

1. Principles of post-operative care
2. Promotion of oral food intake for patients not at nutritional risk
3. Nutritional support for malnourished patients
4. Use of artificial nutritional support
5. Summary

Key Messages

Restoration of normal gastrointestinal function is a key aspect of postoperative care and is promoted by the use of enhanced recovery programs;
Early oral feeding improves outcomes and should be facilitated;
The malnourished patient are at high risk of postoperative complications;
Nutritional support should be considered on an individual basis for all patients undergoing major surgery.

Module 17.4 Nutritional Goals in the Perioperative Period

Learning Objectives

To learn about common methods used to assess nutritional state in preoperative patients;
To review caloric and protein requirements before and after surgery;
To decide what is the most appropriate route of nutrition in various surgical diseases.

Content

1. Nutritional assessment in the preoperative patient
2. Caloric and protein requirements before and after surgery
3. Routes of nutrition in the surgical patient

Key Messages

Only in intestinal failure should parenteral feeding be used;
Subjective global assessment (SGA) is a simple and highly accurate "nutritional" test to predict postoperative complications;
Preoperative parenteral feeding in malnourished patients for five to ten days is associated with a reduction in postoperative morbidity. Preoperative oral or enteral nutritional support in malnourished patients needs further evaluation;
Postoperative caloric and protein requirements are not highly elevated in modern surgical care;
Early oral nutrition is safe after lower gastrointestinal surgery, and decreases infectious morbidity and enhances recovery;
Parenteral feeding in the postoperative patient who cannot be fed orally or enterally for a prolonged period has not been evaluated;
Expert groups recommend waiting for at least five days before total parenteral nutrition is started in well-nourished patients.

Module 17.5 The Traumatized Patient

Learning Objectives

Understand the mechanisms behind the metabolic effects of trauma;
How does the stress response after traumatic injury lead to hypermetabolism;
What does this mean for protein metabolism;
Can certain aspects of the stress response after acute non-surgical trauma be avoided and how can they be treated;
Insights into the relationship between hypermetabolism, alterations in protein metabolism and complications in surgery for trauma.

Content

1. Introduction
2. What happens after trauma?
3. Clinical symptoms
4. Protein kinetics
5. Why is there increased protein degradation during trauma?
6. Minimizing unwanted effects of trauma and its treatment: hypothermia
7. What is the actual substrate mix used by the body after trauma?
8. What metabolic goals should be achieved in traumatized patients?
9. Assessment of efficacy of treatment

Key Messages

Trauma leads to overall catabolism in the body;
Anabolism occurs in splanchnic organs, immune system and in wounds;
Nutrition should support these processes;
Specific nutrients like glutamine may be considered.

Module 17.6 Facilitating Oral or Enteral Nutrition in the Postoperative Period

Learning Objectives

To review the causes of postoperative gastrointestinal paralysis;
To learn in some detail about the perioperative interventions that have been shown to

promote postoperative gut function;
In particular, to learn about the uses of epidural analgesia and multimodal analgesia to promote bowel function, the importance of fluid balance, and the role, if any, of procinetic drugs;
To review additional interventions which may be of use.

Content

1. Postoperative gastrointestinal paralysis
2. Thoracic epidural analgesia
3. Avoidance of opioids
4. Perioperative fluid balance
5. Other interventions to limit postoperative ileus
6. Gastrointestinal function after colonic surgery in enhanced recovery protocols

Key Messages

Postoperative ileus is preventable;
The main alterable causes are inhibitory sympathetic activity, manipulation of the bowel, exogenous and endogenous opioids and fluid overload;
Mid-thoracic epidural analgesia promotes postoperative bowel function by blocking inhibitory reflexes, catecholamine release and eliminating the need for systemic opioid analgesia;
NSAIDs and paracetamol reduce the need for opioids once the epidural analgesia is discontinued;
Maintaining postoperative fluid balance, rather than fluid overload, helps prevent postoperative ileus;
Procinetic drugs have no current role in postoperative ileus, apart from magnesium oxide, which may be beneficial;
Combining several of the above interventions in an enhanced-recovery protocol, it is possible to maintain a normal gastrointestinal transit time after colonic surgery.

Topic 18 Nutritional Support in Intensive Care Unit (ICU) Patients

Module 18.1 Metabolic Response to Stress, Energy Requirements

Learning Objectives

Understand the mechanisms of the physiologic response to stress;
Understand the effects of the critical illness on energy metabolism;
Understand the effects of the critical illness on the adaptation to starvation;
Propose rules for energy supply in critically ill patients.

Content

1. Physiologic response to stress
2. Metabolic response: energy metabolism
3. Energy requirements
4. Adaptation to fasting

Key Messages

The critical illness induces extensive physiological changes, involving energy metabolism and substrate utilization;
Resting energy expenditure is increased in patients with severe trauma, sepsis and burns;

Numerous factors influence resting energy expenditure in critically ill patients: type and severity of illness, organ failure, supportive therapies;
Precise energy requirements are difficult to determine in critically ill patients. Indirect calorimetry allows more a precise estimate of energy requirements, but simple rules are usually used in clinical practice;
Prolonged hypocaloric feeding is associated with clinical complications, energy balance should be calculated in the most ill patients;
Adaptation to fasting is blunted, ketosis is suppressed.

Module 18.2 Use of Macronutrients in ICU

Learning Objectives

Understand glucose metabolism in critically ill patients;
Understand fat metabolism in critically ill patients;
Understand protein metabolism in critically ill patients;
Understand the concept of glucose/fat ratio;
Understand the basis of macro nutrient supply.

Contents

1. Metabolic response
2. Insulin resistance
3. Carbohydrate metabolism
4. Fat metabolism
5. Protein metabolism
6. Use of energetic substrates

Key Messages

Glucose utilization is increased in non-insulin dependent organs and decreased in insulin-dependent organs and tissues;
Lipolysis is activated by the critical illness, particularly in patients with sepsis and acute inflammatory diseases;
Fat utilization is stimulated in fasted and septic patients, reduced in patients with circulatory failure;
Protein catabolism is increased, and exceeds protein synthesis, promoting an erosion of the fat-free mass. Glucose and insulin decrease protein catabolism;
Formulas for critically ill patients should include 1.5-2.0 g/kg protein per day, carbohydrate and lipids. Lipid supply should be reduced in patients with acute ischemic heart diseases and major burns.

Module 18.3 General Principles of Prescription and Management in ICU

Learning Objectives

Key criteria to start nutrition support;
Assessment of nutritional status;
Situations where early enteral nutrition was shown beneficial;
Optimal timing and amount of nutrition support;
Prevention and management of the common complications of nutrition support.

Content

1. Criteria for implementation of nutritional support
2. Nutritional status
3. Timing
4. Amount
5. Composition of nutrition support formulas
6. Basic components
7. Additional components

Key Messages

Increased requirements during critical illness must be matched by appropriate infusion of calories and nitrogen, especially when severe malnutrition is present, in case of insufficient oral intake or expected delay before recovery of eating;
Early enteral nutrition can be systematically considered in patients unlikely to recover their ability to eat within 48 hours after injury;
Nutritional status can be assessed from physical and biological variables combined in scores;
Inappropriately high amounts of energetic substrates can lead to detrimental effects, especially after a long period of fasting;
The use of local algorithms and protocols is recommended to optimize nutrition support.

Module 18.4 Routes of Nutrition in ICU

Learning Objectives

To describe the techniques, the indications and contraindications of enteral and parenteral nutrition therapy;
To describe the access routes for enteral and parenteral infusion, to describe their advantages and disadvantages.

Content

1. Enteral nutrition
   - 1.1 Contra-indications
2. Enteral access
   - 2.1 Gastric access
     - 2.1.1 Naso-gastric tubing and placement
     - 2.1.2 Gastrostomy
   - 2.2 Postpyloric feeding
3. Initiation of enteral feeding
   - 3.1 Prevention and handling of current problems of enteral feeding
   - 3.2 Administration technique
4. Complications
   - 4.1 Gastroduodenal dysfunction
   - 4.2 Diarrhoea
   - 4.3 Constipation
   - 4.4 Parenteral nutrition
5. Complications

Key Messages

Enteral support is always preferable to parenteral nutrition;
Enteral access is available via nasogastric, gastrostomy or post-pyloric tube;
Significant risks of enteral feeding include aspiration, pneumonia and motility disorders;
Parenteral nutrition is associated with catheter-related and metabolic complications.

Module 18.5 Use of Special Substrates in ICU

Learning Objectives

To understand the rationale for the increased requirements of glutamine and antioxidants;
To highlight the physiological importance of glutamine and antioxidant defence.

Content

1. Glutamine
2. Antioxidants
   - 2.1 Introduction
   - 2.2 Sources of reactive oxygen species
   - 2.3 Mechanisms of neutralization of ROS
   - 2.4 Presence of increased oxidative stress in critically ill patients
   - 2.5 Clinical data on the effects of antioxidants
     - 2.5.1 Current recommendations
     - 2.5.2 Recent clinical trials using higher doses of antioxidants
     - 2.5.3 Conventional antioxidant compounds
       - 2.5.3.1 Antioxidant vitamins
       - 2.5.3.2 Trace elements
       - 2.5.3.3 Conclusions

Key Messages

Addition of glutamine and antioxidants improves outcome in critically ill patients;
Glutamine is involved in several pathways and systems involved and active during critical illness;
The systematic increase in oxidative stress is associated with the rapid exhaustion of endogenous antioxidant defense mechanisms;
Trace elements and antioxidant vitamins were found efficient in decreasing infectious morbidity and mortality in critically ill patients.

Topic 19 Nutritional Support outside the Hospital: Home Parenteral Nutrition (HPN) in Adult Patients

Module 19.1 Indications and Epidemiology

Learning Objectives

Learn about indications and epidemiology of HPN;
Learn how to prevent and treat venous access related-complications;
Learn about metabolic complications: liver, bone and nutritional deficiencies;
How to adapt intravenous intake and to optimize oral intake?
Learn about specific aspects of HPN in cancer patients (including ethic);
How to teach the patients and/or care-givers?
How to monitor the patients on HPN?

Content

1. Incidence and prevalence
2. Indications
3. Demographic data of long-term HPN patients

4. Perfusion regimen
5. HPN-related complications
6. Rehabilitation status
7. Prognosis
8. Conclusions

Key Messages

HPN is worldwide used in industrialized countries;
For patients with benign diseases, the main indications are short bowel (80%);
In many European countries as well as in US, cancer has become the main indication for HPN;
The point prevalence of HPN in US is expected to be 5 to 10 times higher than in Europe (from 2 to 12/100 inhabitants);
HPN-related complications are quite rare.

Module19.2 Training and Monitoring

Learning Objectives

Understand the importance of training and monitoring patients on home parenteral nutrition;
Learn about common practice on training and monitoring.

Content

1. Training for HPN
   - 1.1 Introduction
   - 1.2 Patient suitability
   - 1.3 Training objectives
   - 1.4 The teaching practice in Europe
   - 1.5 Training methods
   - 1.6 Training for home parenteral nutrition and catheter related infection.
   - 1.7 Conclusions - training for HPN
2. Monitoring HPN
   - 2.1 Introduction
   - 2.2 How is the monitoring of HPN patients carried out in Europe?
   - 2.3 Guidelines
   - 2.4 Who monitored the patients and at what intervals?
   - 2.5 Which parameters were monitored?
   - 2.6 HPN and handling complications
   - 2.7 Conclusions - monitoring HPN

Key Messages

Training patients for home parenteral nutrition is carried out by specialized personnel usually working together in a team;
Patients are trained in hospital before discharge or in their home;
Training and educating patients significantly reduces the rate of complications and improves the quality of life with HPN;
Official guidelines for training are not available and clinical studies of different training regimes are warranted;
Monitoring of patients on HPN is important to support the patient and to prevent and treat complications;
Monitoring is carried out by the specialized team at the hospital, by a home care agency or by the community nurse;
Intervals between monitoring visits for the stable patient are 2-3 months;

Parameters monitored at visits should include biochemical variables, anthropometry; at every 6 months or yearly, measurements of trace element and vitamin status and bone mineral density;
Studies of the effect of monitoring are needed to support development of guidelines.

Module 19.3 Venous Access for Home Parenteral Nutrition

Learning Objectives

Learn about different central venous access devices (CVAD);
Catheter related complications of infectious and mechanical origin;
Strategy to prevent problems and treatment of complications.

Content

1. Introduction
2. Choice of central venous access
3. PICC lines an option for HPN?
4. Tunneled catheters
5. Implantable ports
6. Conclusions: which type of venous access for HPN
7. Choice of central vein
8. Position of the distal tip of the catheter
9. Loss of vascular access
10. Conclusions: catheter insertion and position
11. Catheter related blood stream infection or sepsis, risk factors
12. Prevention of infection - dressing
13. Antimicrobial impregnated catheters
14. Nutrition support team and patient education
15. Treatment of catheter related blood stream infection
16. Repeated line infection
17. Catheter related thrombosis
18. Conclusions: catheter related infection and thrombosis

Key Messages

Chose access for central venous access device in accordance with the need of the patient;
General use of aseptic techniques are of paramount importance;
Support patients educationally to minimise line related complications;
In case of complications use protocols to treat patients;
Support clinical studies of venous access for HPN patients.

Module 19.4 HPN in Cancer Patients

Learning Objectives

To learn a feeding of the incurable cancer patient (why, which and how);
To understand the impact of HPN on survival and quality of life;
Withdrawing HPN.

Content

1. Introduction
2. Why feed the incurable cancer patient?

3. Which patients should be fed?
4. How to feed?
5. What is the impact of HPN on survival and quality of life?
6. Ethical and spiritual issues: the will-to-live and the “good death”
7. Withdrawing HPN

Key Messages

Why feed the incurable cancer patient?
Which patients should be fed?
How to feed?
What is the impact of HPN on survival and quality of life?
Ethical and spiritual issues: the will-to-live and the “good death”;
Withdrawing HPN.

Module 19.5 Guidelines for Home Parenteral Nutrition Support in Chronic Intestinal Failure

Learning Objectives

How to adapt nutrition support in HPN patients?
What are the nutritional needs of a patient?
How to cover the needs of a patient?

Content

1. Introduction
2. General HPN guidelines
3. Nutritive mixtures
4. Chronic intestinal failure in short gut patients and PN dependency
5. PN dependence and HPN management
6. Patient's management
7. Conclusion

Key Messages

Management of HPN must be an integrated part of the management of the disease which has led to chronic intestinal failure;
A better prognosis is observed in HPN patients having a short but functioning gut than in patients with a longer but non functioning;
Along with medical therapy, dietary management of intestinal failure due to very short bowel is a crucial point which may reduce the PN dependence at its lower level, therefore decreasing the risk of technical and metabolic complications associated with long term HPN;
Indeed, HPN for intestinal failure must not be viewed as “hyperalimentation” but rather a complete nutrition support for each PN cycle with a minimum number of nocturnal cycles per week. This is better observed in patients in which hyperphagia takes place;
Then, HPN is in most cases, a complementary non exclusive mode of nutritional support.

Module 19.6 Metabolic Complications of Home Parenteral Nutrition in Chronic Intestinal Failure

Learning Objectives

Learn about identifying the main metabolic HPN complications in adult patients;
Learn how to prevent and cure these complications.

Content

1. Introduction
2. Fluid and electrolytes
3. Overall complications and hyperglycemia
4. Intestinal consequences of HPN
5. Micronutrient deficiencies
6. Trace element excess
7. HPN associated liver disease (HPNALD)
8. Gallbladder sludge and lithiasis
9. Renal function impairment
10. Metabolic bone disease
11. Summary

Key Messages

HPN metabolic complications are still frequent but they can be significantly decreased through present knowledge, expertise and continued attention;
Most of metabolic complications are multifactoral and interrelated;
Nutrition support team, education and a complete, but non exclusive, HPN adapted to the type of CIF is able to lower the rate of metabolic complications;
Further understanding is needed especially in renal, bone and liver HPN associated complications to ameliorate preventive and curative treatments.

Topic 20 Nutritional Support in Cardio-Vascular Diseases (CVD)

Module 20.1 The Place of Nutrition in the Prevention of CVD

Learning Objectives

To characterize the influence of nutrition on (atherogenic) lipoprotein profile;
To understand the role of nutrition on the multiple parameters involved in the development of atherosclerotic lesions;
To understand the role of nutrient on lesion vulnerability and cardiac arrhythmias;
To become familiar with the preventive role of different nutritional models against CVD;
Develop a food choice plan for avoiding excess intake of saturated fat;
Analyze the relationship between salt intake and high blood pressure;
To integrate nutrition in a preventive lifestyle approach.

Content

1. Epidemiology of preventive and harmful nutrition
2. Nutrition influence on lipid and lipoprotein profile
3. Pleotropic effect on blood vessel wall morphology and function
4. Nutrition and other lifestyle components

Key Messages

Some dietary habits (western nutrition) are associated with a marked risk of CVD, while others (e.g. the Meditation diet) offer a marked protection;
CVD risk may be reduced by more than 80% using an integrated lifestyle approach and nutrition as the most important component;
Preventive nutrition may be adapted to local recourses and cultural habits;
Nutrition influents not only lipoprotein profile but also several other factors (inflammation,

blood pressure, endothelial function, coagulation, heart rate variability, etc) involved in CVD and cardiac accidents;
Although the influence of specific nutrients (e.g. ω-3 PUFAs) is well recognized, the benefits of healthy nutrition are largely due to a combination of factors.

Module 20.2 Nutrition in CVD - Special Diets

Learning Objectives

To give an overview on the importance of lifestyle and diet in secondary CVD prevention;
Identify risk factors for cardiovascular disease related to lifestyle and behaviour patterns;
To give information about adequate nutritional status in patients with cardiac deficiency;
To provide guidelines for evaluation of nutritional status of the patient and for the development of a proper nutritional strategy.

Content

1. Rationale for prevention of CVD
2. Risk factors
3. Nutrition and life style as a prevention strategy
4. Background of atherogenesis
5. Lipid metabolism and nutrition

Key Messages

CVD has become the major cause of mortality and morbidity worldwide;
CVD results from a combination of genetic and environmental factors;
Plasma lipid profile is an important, but certainly not the only risk factor for CVD;
CVD burden could be substantially reduced by early diagnosis and appropriate measures, since atherosclerotic lesions may be substantially improve in response to measures taken;
Prevention includes adequate lifestyle: no smoking, weight control, physical activity, and healthy dietary intake;
The Mediterranean diet is a good example of healthy food;
Healthy elements of the Mediterranean diet may be adapted to nutritional habit of different countries, taking into account differences of taste and culture;
The benefits of a healthy lifestyle exceed, but are added, to those of medical treatment.

Topic 21 Nutrition in Diabetes

Module 21.1 Nutrition in Prevention and Management of Diabetes Mellitus

Learning Objectives

To review risk factors of patient who has a positive family history of type II diabetes;
Interpret the fasting and post-prandial concentration of plasma glucose;
To learn the interaction of medication, activity, food-intake, and blood glucose concentration in diabetes management;
To explain the metabolic abnormalities associated with the diagnosis of type II diabetes;
To apply nutrition recommendations for people with type I and type II diabetes;
Outline principles of nutrition therapy for type I diabetes mellitus;
Describe the principles for nutrition therapy for type II diabetes;
Identify nutrition related complications of type I or II diabetes.

Content

1. Type II diabetes
2. Type I diabetes
3. Obesity
4. Genetic predisposition
5. Evaluation of the risk
6. Metabolism characteristics
7. Nutrition as a curative and preventive measure

Key Messages

Medical Nutritional therapy is pivotal in the management and care of disabetes;
Integration of insulin therapy into eating and exercise habits;
Type 2 diabetes: emphasis on blood glucose control, optimal lipid levels, appropriate calories;
Preventing hyperglycemia prevents complications;
Improved health through optimal nutrition and physical activity;
Individualized based on usual lifestyle habits and need: prevention weight gain for adults and growth and development for children and teens.

Module 21.2 Nutritional Support in Diabetes

Learning Objectives

To be familiar with the long-term dietary management of diabetic patients;
To know the principles of nutritional support of diabetic patients including insulin therapy;
To be able to provide the perioperative management in insulin dependent and non-insulin dependent diabetic patients.

Content

1. Classification
2. Prevalence
3. Complications
4. Long-term nutritional aims
5. Long-term dietary management
6. Nutritional support of the diabetic
7. Oral supplements
8. Enteral nutrition
9. Parenteral nutrition
10. Perioperative management
11. Points to note
12. Principles

Key Messages

The principles of nutritional support of the diabetic are no different from those in the non-diabetic;
However, glucose monitoring is necessary in this group of patients;
The stress response to illness or injury is itself diabetogenic and causes insulin resistance so that insulin may be needed during an acute illness in normally non insulin dependent diabetic and higher doses of insulin than normal may be required in an insulin dependent diabetic;
Elevated blood glucose is associated with poorer outcome and risk of infection.

Topic 22 Nutrition in Lipidemias

Module 22.1 Dislipidemias and Nutrition

Learning Objectives

To characterize the major metabolic pathways of plasma lipoprotein;
To understand inherited alterations in lipoprotein metabolism;
To understand the role of nutrition in modulating pathways of plasma lipoprotein;
To understand the role of other components of life style in modulating pathways of plasma lipoprotein.

Content

1. Production, secretion and composition of plasma lipoprotein
2. Metabolism of lipoprotein in normal conditions
3. Metabolism of lipoprotein in dislipidemias
4. Influence of specific nutrients in modulating of lipoprotein metabolism
5. Influence of general types of nutrition on lipoprotein metabolism
6. Influence of tobacco and sedentarity on lipoprotein metabolism

Key Messages

Plasma lipoproteins are involved in the inter-organ transport of triglycerides and of cholesterol. Important exchanges of protein and lipid components take place between different lipoproteins in the blood circulation. Lipoprotein metabolism involves lipolytic enzymes, transfer proteins, receptors and receptor mediated pathways;
Lipoprotein levels are modulated by genetic and compartmental factors. Lipoprotein fractions are not homogenous but represent a mixture of different particles with some atherogenic fractions (e.g. small dense LDL) being increased in the metabolic syndrome;
Specific nutrient, e.g. ω-3 PUFAs may decrease the number of triglyceride-rich lipoprotein and the subfraction of small dense LDL;
Diet with low content of saturated fats and of added or simple carbohydrates improve lipoprotein profile;
Smoking cessation weight control and physical activity also improve lipoprotein profile.

Module 22.2 Adaptive Changes of Lipid and Lipoprotein Metabolism

Learning Objectives

To characterize changes of lipid and lipoprotein metabolism occurring in severe sepsis and after major trauma;
To understand the new functions of lipoproteins in acute phase conditions;
To understand the potential deleterious effects of these adaptive modifications;
To become familiar with changes occurring in different acute phase conditions;
To know how artificially to feed the patients with lipid disorders.

Content

1. Lipid and lipoprotein concentrations in sepsis and after trauma
2. Changes in lipoprotein production
3. Changes in lipoprotein composition
4. Changes of sites for lipoprotein uptake

Key Messages

Not only the concentration of plasma proteins but also that of lipids and lipoproteins is modified during the acute phase reaction;
The level of cholesterol rich lipoproteins (LDL, HDL) is markedly reduced in acute conditions, while that of triglycerides-rich lipoprotein decreases after trauma but may increase during septic episodes;
The lipid and protein composition of plasma proteins is also modified which may impact on their intravascular metabolism;
HDL loose many protective effects are less involved n reverse cholesterol transport from the periphery to the liver, but provide damage tissues and immune cells with cholesterol, phospholipids and possibly lipid soluble vitamins;
The content of oxidized lipids in plasma lipoproteins is increased in severe sepsis and after trauma.

Topic 23 Nutrition in Obesity

Module 23.1 Nutrition in Prevention and Treatment of Obesity

Learning Objectives

Calculate BMI and explain the results to the patient;
Assess obesity in clinical practice and perform a risk evaluation;
Explain the role of waist circumference measurements;
Explain various treatment strategies for weight management of obese individuals;
Identify dietary behaviors and activity patterns that put a person at risk for body weight gain;
Identify comorbid conditions that complicate obesity and prompt early intervention;
Discuss other methods to assess body fat in addition to BMI;
Outline weight maintenance options after a patient has successfully undergone initial weight loss;
Describe three chronic conditions associated with obesity;
Identify episodes during the life-span that may be associated with increased risk for weight gain.

Contents

1. Obesity and physiological regulation of body weight
2. Weight management: targets and goals
3. Weight management: changing behaviour
4. Nutrition surveillance and policy

Key Messages

Obesity is associated with serious complications, e.g. diabetes, cardiovascular disease and cancer;
These can be decreased by losing 5-10% of weight, reducing insulin resistance, and the production of many atherogenic, pro-coagulatory, diabetogenic, hormonal and metabolically active substances;
Even with such a small reduction in weight, adipose tissue is again capable of protecting organs such as liver, pancreas and muscles from accumulation of fat;
In catabolic illness, obese patients are just as vulnerable to malnutrition and should be screened and given appropriate nutritional support;
The incidence of peri-operative complications is higher in the obese, but has been

significantly reduced by laparoscopic surgery;
The risks of morbid obesity are high and can be significantly reduced by bariatric surgery;
Gastric banding cannot be successful without proper perioperative and postoperative nutritional support and diet education.

Topic 24 Nutrition in Metabolic Syndrome

Module 24.1 Nutrition in Prevention and Treatment of Metabolic Syndrome

Learning Objectives

What is meant by the metabolic syndrome?
Which function does leptin have?
How deos insulin resistance develop?
Which diabetic complications could occur and what are the causes for their development?
How to synthesize O- and N-linked glycoproteins?
Which functions and special characteristics do the enzymes for O-GlcNAc addition and removal have?

Content

1. Definition and prevalence of the metabolic syndrome
2. Pathogenesis
3. Diseases of the metabolic syndrome - adiposity and leptin
4. Diseases of the metabolic syndrome - hypertension
5. Diseases of the metabolic syndrome - dyslipidemia
6. Diseases of the metabolic syndrome - diabetes mellitus type 2 and insulin resistance
7. Diabetic complications and AGEP
8. Glycosylation
9. O-GlcNAc

Key Messages

The metabolic syndrome is a polygenetic disease;
Obesity is the common cause of high triglycerides;
If the Body Mass Index is higher than 30, you are obese;
Leptin regulates energy balance;
Renin-angiotensin-system is more active, if subjects are obese;
Hyperglycemia causes diabetic complications by increased formation of Advanced Glycation End Products (AGEPs);
Glycosylation is the process of addition of saccharides to proteins and lipids;
Most of proteins sythesized in the rough ER undergo glycosylation;
O-GlcNAcylation occurs in the nucleus and cytoplasm;
Altered O-GlcNAcylation may contibute to the development of metabolic syndrome.

Module 24.2 Frontiers in Research of Metabolic Syndrome

Learning Objectives

HSP hypothesis;
What effects has the overexpression/inhibition of GFAT?

Role of OGT in b-cells and effects of overexpression;
What effects have STZ, Alloxan and PUGNAc on b-cells and O-GlcNAcylation? Experimental results?
Regulation of leptin synthesis;
What effects have FFA on the biosynthesis of hexosamines?
Oxidative stress;
How to prevent metabolic disorders?

Content

1. What is the statement of the HSP hypothesis?
2. Why do GFAT and OGT play a so important role?
3. What about the effects of STZ, ALX and PUGNAc?
4. Mechanisms through which FFAs can upregulate the HSP.

Key Messages

HSP flux regulates leptin secretion;
In human with NIDDM GLUT4 function and translocation is impaired;
GFAT can be inhibited by UDP-GlcNAc;
Elevation of O-GlcNAc levels attenuate insulin signaling;
Increased fatty acids upregulate the HSP;
Probably at the level of trancription and translation leptin production is regulated by hexosamines.

Topic 25 Nutritional Support in Neurological Diseases

Module 25.1 Nutritional Support in Acute Stroke

Module 25.2 Nutritional Support in Chronic Neurological Diseases

Learning Objectives

To reckon that all patients with significant, chronic or acute, neurological impairment are at risk of malnutrition;
To be aware that malnutrition ensues either from a progressive decline in function and in the ability to care for oneself or from an impairment of the entire process of eating;
To ensure that every patient has an early nutritional assessment, in which diet history is key, and an early appropriate nutritional care plan implemented, in cooperation with the patient/family/caretakers;
To detect the different stages of dysphagia and to know how prescribe the most appropriate nutritional support for these patients.

Content

1. Introduction
2. Nutritional assessment
3. Nutritional requirements
4. Energy
5. Protein
6. Fluid requirements
7. Nutritional support
8. Dietary treatment
9. Enteral nutrition

Key Messages

Severe and progressive acute or chronic neurological disorders, e.g. closed head trauma, stroke, amyotrophic lateral or multiple sclerosis, Parkinson/Alzheimer's disease are frequently connected with risk of malnutrition;
In particular the problems connected with impaired ability to feed, chew, or swallow must be solved. Nutritional therapy is therefore important part of treatment of these patients;
All methods of dietary support that are used in this group of patients (diet modification, dietary supplements, enteral or even parenteral nutrition) are subject of this chapter;

* Learning objectives, content and key messages are developed for the entire Topic.

Topic 26 Nutritional Support in Cancer

Module 26.1 Pathogenesis of Cancer Cachexia

Learning Objectives

To list the possible mechanisms of cancer cachexia;
To list the possible causes of iatrogenic malnutrition;
To list the commonly accepted indications for nutritional support in surgical and non-surgical patients;
To identify pro and cons of TPN and EN at home;
To explain what is a safe nutritional regimen in terms of water, energy and nitrogen.

Content

1. Introduction
2. Cachexia is important for several reasons
3. Pathophysiology
4. Energy balance
5. Nutritional consequences of therapy
6. Anorexia
7. Indications for and aims of nutritional support
8. Perioperative nutrition
9. Nutrition in malnourished patients
10. Nutrition in non - malnourished patients
11. Enteral versus parenteral nutrition
12. Cancer patients
13. Home artificial nutrition

Key Messages

Cancer cachexia occurs in about 70% of patients in their terminal phase;
Cancer cachexia is associated with the presence of multiple metabolic aberrations;
Artificial nutrition in cancer patients is important to prevent further nutritional depletion;
Perioperative immunonutrition shows beneficial effect in malnourished cancer patients with a reduction of complication and length of hospital stay.

Module 26.2 Treatment of Cancer Cachexia

Learning Objectives

To update the reader about the potential and growing role that anticachectic/orexigenic agents may have in the treatment of cancer cachexia.

Content

1. Introduction
2. Appetite stimulating agents
3. Anticachectic agents

Key Messages

The results of the studies warrant further investigation, it appears that the role of agents able pharmacologically to control the synthesis of the mediators of cachexia, or alternatively to blunt the deleterious interference of these mediators in some metabolic pathways will have a useful role in the future, when combined with nutritional support.

Module 26.3 Nutritional Support during Radiation Treatment

Learning Objectives

To understand the natural history of radiation enteropathy (RE) and the role of the artificial nutrition.

Contents

1. Role of parenteral nutrition
2. Outcome with long-term HTPN

Key Messages

Acute RE is frequently reversible and patients have to be treated in a conservative way with total bowel rest and TPN;
In chronic RE, TPN may have a role in RE which involves large parts of the small bowel or in short bowel syndrome due to previous resective surgery. In these patients TPN may be required indefinitely;
In subacute RE, not amenable to surgery because of multiple scattered lesions, medium term TPN, in hospital or at home, is indicated and may allow resolution of intestinal obstruction and help to restore oral feeding.

Module 26.4 Nutritional Support during Chemotherapy

Learning Objectives

To know that a well conducted artificial nutrition may take effect on the nutritional regime during chemotherapy;
To know the impact of nutritional support on the tumorous process and a tolerance to chemotherapy;
To apply the rules for good clinical practice(standard, recommendations), in reference to the length, the functional capacity and the quality of lives of patients;
To learn to adapt an artificial nutrition to the needs of the patient;
To check temporarily its effectiveness.

Content

1. The role of the standard parenteral nutrition
2. Nutritional efficiency
3. Morbidity and death
4. Chemotherapy tolerance
5. Impact on the tumorous process
6. The role of the normal and the standard enteral nutrition
7. Nutrition and quality of life within chemotherapeutical courses
8. Available researches confines
9. Immunonutritional and pharmaconutritional perspectives and interest
10. Glutamine supplements
11. Arginine supplements
12. Other nutritional supplements

Key Messages

In many cases chemotherapy is a factor that usually complicates cancer diseased's innutrition.
A well conducted artificial nutrition either enteral or parenteral may take effect on the nutritional regime during chemotherapy;
The advantages of an enteral or parenteral nutrition in reference to the prognosis and the tolerance of the treatment (morbidity, death) are still in solution;
The scientific information even proves that parenteral nutrition carried out in the course of chemotherapy increases the risk of infection;
Nowadays, it is absolutely necessary for us to be pragmatic and examine the risk in every single case;
Within chemotherapy courses carried out before serious surgical interventions it is necessary to foresee artificial nutrition instead of severe innutrition;
In case innutrition risks to compromise a chemotherapeutical report, putting the artificial nutrition into practice needs to be discussed;
Within the range of possibility enteral nutrition is preferable in order to decrease the price and the risks (infection risk in particular);
Artificial nutrition has to be adapted to the needs of the patient and its effectiveness must be temporarily checked. The information of the latest researches in immunonutrition and pharmaconutrition suggests some interesting perspectives which need to be confirmed.

Topic 27 Nutritional Support in AIDS

Module 27.1 Nutritional Support in AIDS

Learning Objectives

To identify major causes of wasting in HIV-infected individuals;
To know the nutritional consequences of drug therapy;
To explain what nutritional support is needed for patients with HIV/AIDS;
To obtain insight into metabolic changes in HIV infection.

Content

1. History and pathophysiology
2. Metabolic and nutritional consequences of HIV infection
3. Side effects of drugs
4. Lactic acidosis

5. Lipodystrophia
6. Indications for and aims of nutritional support
7. Optimum nutrition
8. Recommendations for nutritional support
9. Appetite
10. Hypercholesterolemia
11. Cholesterol lowering diet principles
12. Dietary counseling
13. Goals the dietary treatment

Key Messages

Although infection with HIV progresses from acute to a chronic disease treated by multiple drug therapy, nutritional status should not be forgotten;
Until cure of HIV is found, the patient should have access to nutritional therapy to maintain good nutritional status in order to fight the infection and maintain an effective function.

Topic 28 Nutrition in Allergic Diseases

Module 28.1 Nutrition and Food Allergy

Learning Objectives

To know the main pathophysiological characterictics of food allergy - Ig E- and non-Ig E-mediated reactions;
To know naturally occuring food toxins and process indused toxins;
To know the pathophysiological mechanisms of food allergy;
To learn allergic and sensitivity reactions of food components;
To know the main clinical symptoms of food allergy;
To understand the principles of nutritional therapy in food allergy;
To understand the role of particular components of nutritional diet in prophylaxis of food allergy - role of breast feeding.

Content

1. Background and definitions
2. Epidemiological data.
3. Naturally occuring food toxins. Process indused toxins
4. Pathophysiology of food allergy
   - 4.1 Ig E-mediated reactions
   - 4.2 Non-Ig E-mediated reactions
5. Allergic and sensitivity reactions to food compononents
6. Clinical symptoms of food allergy
7. Diagnostic tests
8. Principles of nutritional therapy in food allergy
9. Natural history and clinical follow up of the patients
10. Nutritional therapy in food allergy patients
11. Prophylaxis
    - 11.1 Role of breast feeding in prevention of atopy
    - 11.2 Role of food allergen avoidance in prevention of food allergy reactions

Key Messages

The prevalence of food allergy is 3-4% in pediatric poulation and 1-2% in adults;
In subjects developing food allergy reactions, food antigen-specific Ig E antibodies and/ or abnormal T cells responses develop;
Non-Ig E mediated reactions may consist of antibody mediated (type II) hypersensitivity immune complex reactions(type III) or cell mediated (type IV) hypersensitivity;
The majority of clininical symptoms are results of Ig E mediated reactions: skin (urticaria/angiooedema) respiratory, gastrointestinal;
The strict allergen avoidance remains the only documented form of therapy that is universaly successful;
Breast feeding (especially with maternal avoidance of such major allergens as milk, egg, peanut and fish durring lactation) can postpone atopic disease in high risk infants.

Topic 29 Nutrition in Hereditary Diseases

Module 29.1 Nutrition in Phenylketonuria

Learning Objectives

To know the principles of phenylalanine metabolism and genetic bases of phenylketonuria (PKU);
To know the main nutritional anomalies in PKU;
To learn the main principles of nutritional support - initiation and chronic care;
To know nutritional requirements in patients with PKU;
To use appropriate products for feeding;
To know how to apply low-phenylalanine and phenylalanine-free, chemically defined medical foods;
To know when to apply natural foods;
To know the managements' problems of nutritional support in patients with PKU;
To learn how to assess the nutritional support and results of therapy.

Content

1. Introduction
2. Principles of phenylalanine metabolism and physiology
3. Genetic bases of phenylketonuria (PKU) disease and newborn screening
4. Nutritional anomalies in PKU
5. Principles of nutritional support - initiation and chronic care
6. Nutritional requirements
7. Low-phenylalanine and phenylalanine-free, chemically defined medical foods
8. Natural foods
9. Managements' problems
10. Assessment of nutritional support and results of therapy
11. Diet discontinuation

Key Messages

Phenylketonuria is a group of disorders results from defects in several enzymes of phenylalanine metabolism. Clinical and genetic heterogeneity of PKU have to be in mind;
It must not be forgotten that based on the newborn screening the nutritional therapy of the disease should be instituted before the third week of the life;
Impaired phenylalanine hydroxylase activity should be corrected with phenylalanine-restricted, tyrosine-supplemented diet;

Therapy of the child with biopterin-deficient form requires admission of tetrahydrobiopterin and phenylalanine-restricted, tyrosine-supplemented diet;
Long term care of the patients with classic PKU dictates that proprietary chemically defined products (medical foods) and natural foods provide all nutrients in required amounts;
Certain clinicians have suggested that the diet might be discontinued at 10-12 years of age with no adverse effects;
Early diagnosis and treatment of infants with PKU with nutritionally adequate phenylalanine-restricted, tyrosine-supplemented diet have promoted normal growth and prevented severe mental retardation.

Module 29.2 Nutrition in Lactose Intolerance

Learning Objectives

To know lactose metabolism and genetic bases of lactose intolerance;
To know the main nutritional anomalies in lactose intolerance;
To learn the main principles of nutritional restrictions;
To use appropriate products for feeding;
To know when to apply natural foods;
To learn how to assess the nutritional support and results of therapy.

Content

1. Introduction
2. Principles of carbohydrate digestion and absorption
3. Genetic bases of lactose intolerance
4. Primary lactase deficiency in newborns and infants
5. Lactose intolerance in elderly
6. Secondary lactase deficiencies as a result of diseases of GIT
7. Testing of lactose intolerance
8. Principles of diet in lactose Intolerance

Key Messages

Lactose intolerance is a disorder resulting from defect enzyme of lactose digestion;
Enzyme deficiency of lactose Intolerance could be primary or secondary;
Secondary lactose intolerance results from the disorders of intestinal tract, celiac disease, intestinal infections and others;
It must not be forgotten that specific diet should be introduced as a nutritional therapy.

Module 29.3 Nutrition in Celiac Disease

Learning Objectives

1. To know the physiology of small bowel mucosa and pathology in celiac disease;
2. To know the genetic bases and pathogenesis of celiac disease;
3. To learn the main clinical manifestation of celiac disease;
4. To know the principles of nutritional gluten-free diet;
5. To apply appropriate gluten-free diet;
6. To use appropriate products for nutrition in patients with celiac disease.

Content

Introduction
Physiology and pathology of small bowel mucosa
Prevalence, genetics and pathogenesis of celiac disease
Clinical manifestation of celiac disease and investigations
Treatment principles of nutritional gluten-free diet
Nutritional requirements and assessment

Key Messages

Changes in celiac disease range in severity form intraepithelial lymphocytic infiltration to complete loss villi and crypt hyperplasia;
Dietary exclusion of gluten usually results in restoration of a more normal mucosal appearance within 2-3 months;
The interaction between CD4 cells and prolamin peptides bound to a celiac-associated HLA-DQ molecule is important in bringing about the pathologic changes associated with celiac disease;
The presentation of celiac disease is highly variable ranging from mild, nonspecific features through monodeficiency state to a full-blown classic panmalabsorbtion syndrome;
Dietary avoidance of gluten is central to management of celiac disease;
The diet should be supplemented initially with appropriate vitamins and minerals;
The recovery of normal villous appearance usually takes 2 to 3 months;
Significant differences exist internationally in the gluten-free diet.

Module 29.4 Nutrition in Cystic Fibrosis

Learning Objectives

To know the clinical heterogeneity of cystic fibrosis;
To know the difference between innutrition and natural need of nutritional support;
To learn how to correct a probable nutritional loss of the patient;
To know when nutritional support is necessary;
To apply enteral nutrition with appropriate debit based on of the estimated age, weight and sex;
To use appropriate products for enteral nutrition following the rules for their application.

Content

1. Introduction
2. Nutritional anomalies' physiology
3. Energetic import decrease
4. Energetic consumption increase
5. Energetic loss decrease
6. Conditions for beginning nutritional support
7. Oral supplements are the first level of intervention
8. Enteral nutrition with long debit
9. Parenteral nutrition
10. Practical advice

Key Messages

Clinical heterogeneity of cystic fibrosis must not be forgotten;
We must know that there is a difference between innutrition and natural need of nutritional support;

We should correct a probable nutritional loss after checking the exocrine pancreas function as well as the absence of broncho-pulmonary infection or disturbance in glucose metabolism;
Nutritional support is necessary in case of unchanged or decreased weight for the last three months and when the proportion weight - age is lower than 90% of the expected values;
The night debit of enteral nutrition have to range from 1000 to 1500 kcal.m^2 bodily surface;
The total daily energetic import must represent from 120% to 150% of the estimated age, weight and sex;
Products with poly-elementary components should not be regarded as more effective than products containing polymers;
The use of enteral nutrition products with permanent debit that are poor in carbohydrates and rich in fats is appropriate only for patients with severe respiratory insufficiency.

Topic 30 Nutrition in Skeletal and Joint Diseases

Module 30.1 Nutrition in Prevention and Management of Osteoporosis

Learning Objectives

To learn epidemiological data incidence and prevalence of osteoporosis;
To know nutritional determinants of bone density in physiological state and fracture risk;
To learn principles of diet based on physical activity;
To learn principles of diet in osteoporosis;
To know the specific recommendations of a beneficial diet in prevention of osteoporotic fractures.

Content

1. Introduction
2. Epidemiology
3. Nutritional determinants of bone density and fracture risk (Ca, Vit. D, P, Na, Fl, Trace elements, Protein)
4. Diet, physical activity and osteoporosis
5. Strength of evidence
6. Disease-specific recommendations

Key Messages

Worldwide variation in the incidence and prevalence of osteoporosis is difficult to determine because of problems with definition and diagnosis;
Diet appears to have only a moderate relationship to osteoporosis, but calcium and vitamin D are both important, at least in older populations;
Convincing evidence indicates that physical activity, particularly activity that maintains or increases muscle strength, coordination and balance as important determinants of propensity for falling, is beneficial in prevention of osteoporotic fractures. In addition, regular lifetime weight-bearing activities, especially in modes that include impacts on bones and are done in vigorous fashion, increase peak bone mass in youth and help to maintain bone mass in later life.

Topic 31 Nutrition in Behavioral Disorders

Module 31.1 Nutrition in Anorexia Neurosis

Learning Objectives

To characterize anorexia neurosis and understand the role of its characteristic fears;
To learn the main markers of anorexia;
To understand the role and necessity of a change in nutritional manners and habits, of the patient;
To explain what nutritional support is needed for patients with anorexia;
To learn how to set up stable ways of communication with a patient and to discuss with a patient the role of a change and the final physical weight and its decrease rhythms.

Content

1. Anorexia neurosis definition
2. Pathophysiology
3. Clinical count
4. Epidemiological information
5. Diagnosis
6. Therapeutical manners
7. Nutritional insurance
8. Correction in the disturbance of nutritional manners or habits: psychotherapy and support
9. Set up enduring links with the world around

Key Messages

Anorexia is severe disturbance in the nutritional manners and longing for losing weight, fear of nutrition and fear of growing fat are its characteristic features;
Innutrition may be highly severe and may lead to death (in 10% of the cases after 10 years of evolution);
Plasma proteins are markers that rest for a long period of time in norm. The decrease in their concentration is in relation with or as a result of the existence of additional decease (future infection);
Hypocalciemy which is a result of vomiting and bulimia are adverse features for either a short or a long period of time;
In case of innutrition nutritional support is absolutely necessary. It is a part of the "triple" therapeutical lay out: renutritional insurance, a change in nutritional manners and habits, set up stable ways of communication;
The final physical weight and its decrease rhythms are aims that must be discussed with patient in advance. Enteral import should be changed depending on oral reception and the level of innutrition;
In case of extreme innutrition it is necessary to decrease protein and sodium import and increase potassium and zinc import.

Module 31.2 Nutrition in Bulemia

Learning Objectives

To know pathophysiologic changes in bulimia;
To learn clinical features of bulimia nervosa and main complications;
To learn diagnostic criteria for bulimia nervosa;

To understand main principles of dietary treatment and correction of nutritional disturbance;
To learn characteristics of nutritional support in hospital;
To know outcome of bulimia and needs of patient follow-up support.

Content

1. Bulimia definition
2. Pathophysiologic changes in bulemia
3. Etiology and pathogenesis
4. Epidemiological information
5. Clinical aspects and complications
7. Diagnostic criteria and differential diagnosis
8. Treatment
   - 8.1 Dietary treatment correction in disturbance of nutritional manners and habits.
   - 8.2 Outpatients treatment
   - 8.3 Hospital treatment - nutritional support
9. Outcome and patient follow-up

Key Messages

Diagnostic criteria essential features of episodic binge eating, fear of not being able to stop eating voluntary, self-induced vomiting, fasting and persistence overconcern with body shape and weight;
Initial goal of dietary treatment is weight stabilisation until eating behaviors are well regulated with additional emphasis on control of binging and purging;
Follow-up support and nutrition needs to continue even after weight has been stabilised;
A variety of individual and family nutritional treatment techniques have been developed, but superiority of any one technique has not been established;
The decision regarding hospitalisation is based on the severity and rapidity of weight loss; degree of malnutrition; the inability of control vomiting; the presence of electrolyte disturbance or other complications;
Outcome studies of bulimia nervosa are still rare and in few has follow-up been more than 1 year.

Module 31.3 Nutrition in Alcohol and Drug Abuse

Learning Objectives

To learn the content, nutritional value of alcoholic beverages and influence of ethanol on metabolic rate;
To know the main characteristic of nutritional status of alcoholics;
To explain effects of ethanol on digestion and absorption;
To summarize shortly effects of ethanol on nutrients metabolism and alterations in their metabolism;
To learn the organ damage in alcoholics;
To understand problems of nutrition in alcoholics;
To learn basic principles of nutritional therapy in alcoholism.

Content

1. Nutritional value of alcoholic beverages
2. Nutritional status of alcoholics
3. Metabolism of alcohol. Effects of ethanol on digestion and absorption
4. Alterations of nutrient metabolism in alcoholics

4.1 Water soluble vitamins
4.2 Fat soluble vitamins
4.3 Vitamin K
5. Alterations of metabolism of water, minerals and electrolytes
6. Effects of ethanol on metabolism of carbohydrates
7. Effects of dietary factors on ethanol metabolism
8. Alcohol, nutrition and organ damage in alcoholic
8.1 Liver
8.2 Stroke
8.3 Heart
8.4 Blood and bone marrow
9. Nutritional therapy in alcoholism

Key Messages

Heavy drinkers may derive more than half their daily calories from ethanol;
Ethanol increases oxygen consumption in normal subjects, and does so to a greater degree in alcoholics;
Alcohol intake is associated with wide spectrum of nutritional state- most of alcohol-consuming public has slight if any detectable impairment, whereas those hospitalized for medical complications are likely to be severely malnourished;
Alcohol consumption is associated with motility chances in gastrointestinal tract, effects the digestion and absorption. The most common effects of alcohol consumption are diarrhea, weight loss, cirrhosis, malabsorbtion;
Clinical or laboratory evidence of fat-soluble vitamins deficiency with increased alcohol intake and poor diet does not occurred as readily as it does for water-soluble vitamins;
Alcoholics with chronic liver disease often have disorders of water and electrolyte balance (magnesium, iron, zinc, copper and trace elements);
Nutritional therapy in alcoholism is directed at the prevention of illness due to alcoholism, treatment of documented or presumed deficiencies, and management of complication of alcoholism.

Topic 32 Food Safety

Module 32.1 Food Safety. Exposure to Toxic Environment

Learning Objectives

To define food safety;
To know basic terms on food safety;
To discuss food hazards;
To know food safety assessment criteria;
To understand basic principles of food safety;
To be familiar with global strategy on food safety 5 keys to safer food (WHO).

Content

1. Introduction
2. Definitions
3. Food safety criteria
4. Biological and chemical hazards
5. Food safety assessment procedure
6. Toxicological data surveying

7. Regulations concerning food safety
8. Conclusion
9. Five keys to safer food

Key Messages

Food safety;
Consumers ;
Hazards;
Risk assessment;
Nutritional toxicology;
Five keys to safer food.

Topic 33 Nutrition and Public Health

Module 33.1 Nutrition and Public Health

Learning Objectives

To give learners an overview of public health ideology;
To examine the role of diet in a range of chronic diseases of importance in public health in both developed and developing countries;
To give learners "know-how" of promotion of good health and health education.

Content

1. Public health in historical perspective: Public health ideology of "human rights", public health history
2. Health systems: Evolution, legislation, comparison and criticisms of health systems in the European context
3. Environment: Environment and health, implications of environmental policies for nutrition and physical activity
4. Public health policy: Interactions between health, nutrition (including physical activity) and agricultural policies. European dimension

Key Messages

The importance of food, nutrient and dietary intakes in Europe; epidemiology and diet-disease relationships;
Interactions among nutrition, lifestyle and other risk factors of disease, including genetics;
Role of diet in major European public health problems: obesity, cardiovascular disease, hypertension, cancer, dental disease, osteoporosis and nutritional deficiencies;
Nutrition policies and dietary guidelines. Nutritional problems in developing countries;
Concept of healthy nutrition. The role of nutrition in the prevention of disease and the promotion of good health;
Effecting dietary change. Health education and health promotion. Nutrition surveillance. Nutrition intervention programmes.

Topic 34 Nutrigenomics

Module 34.1 Nutrigenomics - New Research Approaches

Learning Objectives

To give students an overview of the development of nutrigenomics as a multidisciplinary field of medical science and practice;
Defining nutrigenomics as integrative science based on new research approaches;
Introducing basic terms on nutrigenomics;
Introducing basic technologies and research approaches used in nutrigenomics.

Content

1. Introduction in nutrigenomics
2. Scientific disciplines contributing to nutrigenomics
3. The new technologies
4. Sophisticated bioinformatics approaches
5. Transgenic mouse models and cellular models
6. Detecting the two hits
7. The second strategy - systems biology approach

Key Messages

The basics of genetics, genomics and gene regulation with relation to diet;
The basic approaches: transcriptomics, proteomics, metabolomics, epigenetics;
New genomics technologies;
General approaches: hypothesis-driven approach, systems biology approach;
The concepts of nutrigeneticsgenetic - susceptibility, SNPs, polygenic (complex) diseases, "personalized" diet.

Module 34.2 From Nutrients to Genes: Response to Nutrients

Learning Objectives

Have understanding of the concepts of molecular nutrition research (signals and signaling pathways, use of animal models);
Have understanding of identification of early biomarkers;
Be able to read and understand literature of the field (molecular nutrition and nutrigenomics);
Have some (practical) knowledge how to apply molecular nutrition and nutrigenomics in the lab;
Be able to extract relevant data/information from internet for molecular nutrition research;
Be able to understand a "nutrigenomics" experiment;
Have understanding on the evolution of genomic versus food patterns. Dietary signaling and sensing.

Content

1. Dietary Signals: From Nutrients to Genes (diet x genes)
2. Nutrigenetics and personalized diets (diet x genotypes)
3. Specific nutrients and foods for specific individuals or groups
4. Regulatory, legal and ethical considerations

5. Evolution of genomics versus food patterns
6. Concluding remarks
7. Glossary

Key Messages

Discussion on basic mechanisms of dietary signaling and sensing (diet x genome);
Discussion on nutrigenetics (diet x genotype);
Introducing some regulatory, legal and ethical issues of nutrigenomics;
Discussion on evolution of genomic versus food patterns;
Nutrigenetics;
Personalized diet;
The concept of “thrifty” genotype;
Regulatory, legal and ethical issues.